Q1.

(a) $\pi \approx 3 + \dfrac{1}{6 + \dfrac{13}{16}}$

$= 3.14678... \left(\dfrac{343}{109}, 3\frac{16}{109} \right)$ ***(A1)***

$= 3.1468$ ***A1***

Note: Award ***A1*** for correct rounding to 4 decimal places. Follow through within this part.

[2 marks]

(b) $\left| \dfrac{3.1468 - \pi}{\pi} \right| \times 100$ ***(M1)***

Note: Award ***M1*** for substitution of their final answer in part (a) into the percentage error formula. Candidates should use the exact value of π from their GDC.

$= 0.166(\%)$ $(0.165754...)$ ***A1***

[2 marks]

Total [4 marks]

Q2.

(a) (i) 23 mg ***A1***

(ii) $1 - 0.85$ **OR** $\dfrac{23 - 19.55}{23}$ **OR** 0.15 ***(M1)***

15 (%) ***A1***

[3 marks]

(b) $23(0.85)^{10}$ ***(M1)***

4.53 mg $(4.52811\ldots)$ ***A1***

[2 marks]

Total [5 marks]

Q3.

(a) $r = 0.933$ $(0.933419...)$ **A2**

[2 marks]

(b) strong **A1**

Note: Answer may include "positive", however this is not necessary for the mark.

[1 mark]

(c) $t = 0.228x + 24.3$ $(t = 0.227703...x + 24.3153...)$ **A1**

Note: Condone y in place of t. Answer must be an equation.

[1 mark]

(d) $(t =)$ $0.227703... \times 57 + 24.3153...$ **(M1)**

Note: Award ***(M1)*** for correct substitution into their regression line.

$(t =)$ 37.3 minutes (37.2944) **A1**

Note: Accept 37.1 and 37.4 from use of 2sf and/or 3sf values.

[2 marks]
Total: [6 marks]

Q4.

1. height of triangle at roof $= 1.35 - 0.9 = 0.45$ **(A1)**

Note: Award ***A1*** for 0.45 (height of triangle) seen on the diagram.

slant height $= \sqrt{0.45^2 + 0.45^2}$ **OR** $\sin(45^\circ) = \dfrac{0.45}{\text{slant height}}$ **(M1)**

$= \sqrt{0.405}$ $(0.636396..., 0.45\sqrt{2})$ **A1**

Note: If using $\sin(45^\circ) = \dfrac{0.45}{\text{slant height}}$ then ***(A1)*** for angle of 45°, ***(M1)*** for a correct trig statement.

area of one rectangle on roof $= \sqrt{0.405} \times 0.9$ $(= 0.572756...)$ **M1**

area painted $= (2 \times \sqrt{0.405} \times 0.9 = 2 \times 0.572756...)$
$1.15\ \text{m}^2$ $(1.14551...\ \text{m}^2, 0.81\sqrt{2}\ \text{m}^2)$ **A1**

[Total 5 marks]

Q5.

(a) attempt to substitute into length of arc formula ***(M1)***

$\frac{140°}{360°} \times 2\pi \times 56$

$137 \text{ cm} \quad \left(136.833\ldots, \frac{392\pi}{9} \text{ cm}\right)$ ***A1***

[2 marks]

(b) subtracting two substituted area of sectors formulae ***(M1)***

$\left(\frac{140°}{360°} \times \pi \times 56^2\right) - \left(\frac{140°}{360°} \times \pi \times 10^2\right)$ **OR** $\frac{140°}{360°} \times \pi \times \left(56^2 - 10^2\right)$ ***(A1)***

$3710 \text{ cm}^2 \quad (3709.17\ldots \text{ cm}^2)$ ***A1***

[3 marks]

Total [5 marks]

Q6.

1. (a) $\sin(\hat{BSK}) = \frac{218}{1200}$ **OR** $\frac{\sin(\hat{BSK})}{218} = \frac{\sin(90°)}{1200}$ ***(M1)***

Note: Award ***M1*** for a correct trig formula. Accept other variables representing $\hat{BSK}$.

$(\hat{BSK} =) \ 10.5° \ (10.4668...)$ ***A1***

Note: Award ***A1*** for the radian answer, $0.182681...$. Award ***M1A0*** if the candidate finds the correct angle of elevation but then uses it to find a complementary angle as their final answer.

[2 marks]

(b) $SB^2 + 218^2 = 1200^2$ **OR** $\cos(10.4668...) = \frac{SB}{1200}$ **OR** $\tan(10.4668...) = \frac{218}{SB}$ **OR**

$\frac{BS}{\sin(79.5331...°)} = \frac{1200}{\sin(90°)}$ ***(M1)***

$1180 \text{ (m)} \quad \left(\sqrt{1392476}, 1180.03...\right)$ ***A1***

[2 marks]

(c) 1.18×10^3 ***A1A1***

Note: Award ***A1*** for 1.18
Award ***A1*** for 10^3
Accept their rounded answer to part (b).
Award ***A0A0*** for answers of the type: 11.8×10^2.

[2 marks]

Total [6 marks]

Q7.

(a)

	Event		Rank	
Country	**Long Jump (m)**	**High Jump (m)**	**Long Jump Rank**	**High Jump Rank**
Germany	7.64	2.11	1	**1**
France	7.52	2.08	2	**2**
Estonia	7.49	1.84	3	**10**
Canada	7.44	2.02	4	**4.5**
Netherlands	7.33	2.05	5	**3**
Ukraine	7.28	2.02	6	**4.5**
Algeria	7.22	1.90	7	**8**
Austria	7.11	1.87	8	**9**
Grenada	6.98	1.99	9	**6**
Japan	6.64	1.96	10	**7**

A1A1

Note: Award ***A1*** for ranking of tied heights, ***A1*** for correct ranking of non-tied heights.

[2 marks]

(b) $(r_s =)\ 0.541 \quad (0.541035\ldots)$ ***A2***

Note: Award ***A2*** for an answer of $0.539\ (0.539393\ldots)$ from use of the formula for Spearman's rank correlation coefficient when data has tied ranks.

[2 marks]

(c) moderate (correlation) ***A1***

as long jump ranking increases, high jump ranking will (likely) increase ***A1***

[2 marks]

[Total: 6 marks]

Q8.

(a) attempt to substitute into percentage error formula *(M1)*

$$\left|\frac{53632000-55625000}{55625000}\right|\times 100$$

3.58 (%) (3.58292…(%)) *A1*

Note: Award ***(M1)A0*** for a final answer of $-3.58(\%)$ or 0.0358.

[2 marks]

(b) (i) 278 000 000 *A1*

(ii) 2.78×10^{8} *A1A1*

Note: Award ***A1*** for correct mantissa, consistent with their answer in part (b)(i).
Award ***A1*** for a correct exponent, consistent with their answer in part (b)(i).
Award ***A0A0*** for answers such as 27.8×10^{7}.

[3 marks]
Total [5 marks]

Q9.

(a) (i) $T=0.552G+6.36 \quad (=0.552139...G+6.35703...)$ *A1A1*

Note: Award ***A1*** for **correct** values of a and b, ***A1*** for an equation using these **correct** values.

(ii) $(r=)$ 0.994 $(=0.993910...)$ *A1*
there is a (very) strong positive linear correlation *R1*

Note: If r is missing award ***A0R0***.

[4 marks]

(b) attempt to substitute 13 into their regression equation *(M1)*
$T=0.552139...(13)+6.35703...$

13.5 (mins) $(=13.5348...)$ *A1*

[2 marks]

(c) **EITHER**
using the T on G regression line cannot (always) reliably make a prediction for G *R1*
OR
equation is for Time on Gradient not Gradient on Time. *R1*
OR
this estimate is an extrapolation *R1*
OR
there is no reason to assume this new hill has constant gradient *R1*

[1 mark]
[Total 7 marks]

Q10.

Markscheme

$1.96\,(\text{m})$ ***A2***

Note: Award ***A1*** for substitution into the formula for the mean

e.g. $\frac{1.67+1.60+1.68+\ldots}{6}$.

[2 marks]

(a.ii) the median height.

Markscheme

$1.94\,(\text{m})\quad(1.935)$ ***A1***

[1 mark]

(a.iii) the modal height.

Markscheme

$2.31\,(\text{m})$ ***A1***

[1 mark]

(a.iv) the range of the heights.

Markscheme

$2.31-1.60$ ***(M1)***

Note: Award ***M1*** for recognizing 2.31 **and** 1.60 as the critical values.

$0.71\,(\text{m})$ ***A1***

[2 marks]

(b) Write down the shortest possible height of Gheorghe.

Markscheme

$1.975\,(\text{m})$ **OR** $197.5\,(\text{cm})$ ***A1***

[1 mark]

Q11.

Markscheme

identifying the largest and smallest values: $(\$)\,255$, $(\$)\,49$ ***(M1)***

$(\$)\,206$ ***A1***

[2 marks]

Markscheme

$(\$)\,137 \quad (137.1)$ ***(M1)A1***

[2 marks]

Markscheme

$(\$)\,74.5 \quad (74.4693\ldots)$

Note: The ***(M1)*** mark is for correct GDC use and hence can be awarded if either of the values is correct. An answer of $78.4976\ldots$ in (b)(ii) is awarded ***A0*** but is sufficient to credit the ***(M1)***.

[1 mark]

Markscheme

(mean=) $(\$)\,117 \quad (117.1)$ ***A1***

[1 mark]

Markscheme

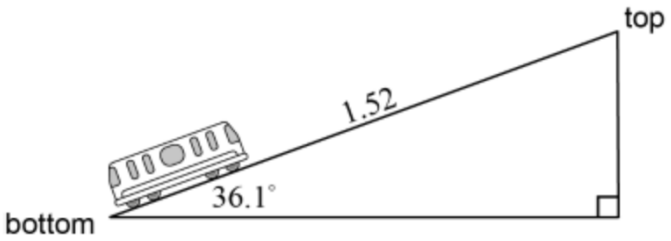
(standard deviation =) $(\$)\,74.5 \quad (74.4693\ldots)$ ***A1***

Note: If their answer to part (c)(ii) is incorrect, it should match their answer to part (b)(ii) to be awarded ***A1(FT)***.

[1 mark]

Q12.

Markscheme



A1A1

A1 for correct angle of elevation labelled as 36.1

A1 for hypotenuse labelled as $1.52\ (\text{km})$

[2 marks]

Markscheme

$1.52 \times \sin 36.1^\circ$ ***(A1)***

$0.896\ (\text{km})\quad (0.895578\ldots(\text{km}),\ 896\,\text{m})$ ***A1***

[2 marks]

Q13.

(a) convenience sampling *A1*

[1 mark]

(b) (i) 95% *A1*

(ii) 1% *A1*

(iii) 2% *A1*

(iv) 98% *A1*

[4 marks]

(c) (i) 0.95×0.02 *(M1)*

0.019 *A1*

(ii) $0.05 \times 0.01 + 0.95 \times 0.98$ *(M1)(M1)*

Note: Award ***M1*** for summing two products and ***M1*** for correct products seen.

$0.932 \quad (0.9315)$ *A1*

(iii) recognition of conditional probability *(M1)*

$$\frac{0.05 \times 0.01}{0.05 \times 0.01 + 0.95 \times 0.98}$$ *A1*

$0.000537 \quad (0.000536768\ldots)$ *A1*

Note: Accept 0.000536 if 0.932 used.

[8 marks]

(d) **EITHER**

sample may not be representative of population *A1*

OR

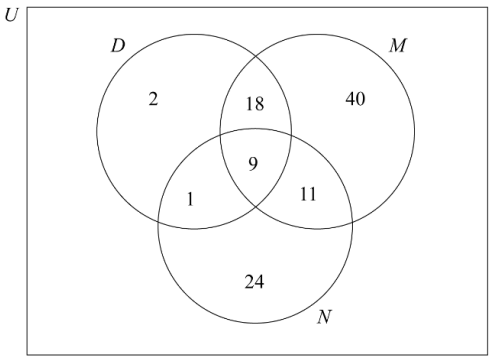
sample is not randomly selected *A1*

OR

unrealistic to think expected and observed values will be exactly equal *A1*

[1 mark]

(e)



A1A1A1

Note: Award ***A1*** for rectangle and 3 labelled circles and 9 in centre region; ***A1*** for 2, 40, 24; ***A1*** for 18, 1, and 11.

[3 marks]

(f) $18 + 9 + 1 + 11 + 2 + 40 + 24$ *(M1)*

105 *A1*

Note: Follow through from the entries on their Venn diagram in part (e). Working required for ***FT***.

[2 marks]

Total [19 marks]

Q14.

(a) Quota sampling **A1**

[1 mark]

(b) 10 (hours) **A1**

[1 mark]

(c) $15-7$ **(M1)**

Note: Award ***M1*** for 15 and 7 seen.

8 **A1**

[2 marks]

(d) indication of a valid attempt to find the upper fence **(M1)**

$15+1.5\times 8$

27 **A1**

$25<27$ (accept equivalent answer in words) **R1**

Jason is correct **A1**

Note: Do not award ***R0A1***. Follow through **within** this part from *their* 27, but only if their value is supported by a valid attempt **or** clearly and correctly explains what their value represents.

[4 marks]

(e) "negative" seen **A1**

Note: Strength cannot be inferred visually; ignore "strong" or "weak".

[1 mark]

(f) correct substitution **(M1)**

$y=-1.54\times 1.5+98.8$

96.5 (%) (96.49) **A1**

[2 marks]

(g) not reliable **A1**

extrapolation **OR** outside the given range of the data **R1**

Note: Do not award ***A1R0.*** Only accept reasoning that includes reference to the range of the data. Do not accept a contextual reason such as 1.5 hours is too short to read the book.

[2 marks]

(h)

	Book							
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Rank – Number of pages	**1**	3	5	2	6	8	4	7
Rank – Top 50 Rating	**1**	2	3	4	5	6	7	8

A1A1

Note: Award ***A1*** for correct ranks for 'number of pages'. Award ***A1*** for correct ranks for 'top 50 rating'.

[2 marks]

(i) (i) 0.714 $(0.714285...)$ ***A2***

Note: ***FT*** from their table.

(ii) **EITHER**
there is a (strong/moderate) positive association between the number of pages and the top 50 rating. ***A1***

OR
there is a (strong/moderate) agreement between the rank order of number of pages and the rank order top 50 rating. ***A1***

OR
there is a (strong/moderate) positive (linear) correlation between the rank order of number of pages and the rank order top 50 rating. ***A1***

Note: Follow through from their value of r_s .

[3 marks]

Total [18 marks]

Q15.

(a) attempt to use sine rule *(M1)*

$\frac{\sin A\hat{B}O}{25.9} = \frac{\sin 10^\circ}{6.36}$ *(A1)*

45.0° $(45.0036...^\circ)$ *A1*

Note: Accept an answer of 45° for full marks.

[3 marks]

(b) $(O\hat{A}B =)$ $124.996...^\circ$ *(A1)*

attempt to use area of triangle formula *(M1)*

$\frac{1}{2} \times 25.9 \times 6.36 \times \sin(124.996...^\circ)$ *(A1)*

$67.5\ m^2$ $(67.4700...\ m^2)$ *A1*

Note: Units are required. The final ***A1*** is only awarded if the correct units are seen in their answer; hence award ***(A1)(M1)(A1)A0*** for an unsupported answer of 67.5. Accept $67.4670\ldots m^2$ from use of 3 sf values.
Full follow through marks can be awarded for this part even if their $O\hat{A}B$ is not obtuse, provided that all working is shown.

[4 marks]

(c) attempt to use cosine rule *(M1)*

$(BK =)\sqrt{12^2 + 6.36^2 - 2 \times 12 \times 6.36 \times \cos 45^\circ}$ *(A1)*

8.75 (m) (8.74738…(m)) *A1*

Note: Award ***(M1)(A1)(A0)*** for radian answer of 10.2 (m) (10.2109…(m)) with or without working shown.

[3 marks]

(d) **METHOD 1**

attempt to use sine rule with measurements from triangle OKX *(M1)*

$\frac{OX}{\sin 51.1^\circ} = \frac{22.2}{\sin 53.8^\circ}$ *(A1)*

$(OX =)$ 21.4 (m) (21.4099…)(m) *A1*

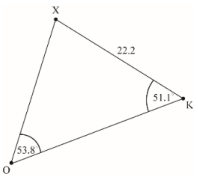
(21.4 (m) < 22.2 (m))

Odette is closer to the football / Khemil is further from the football *A1*

Note: For the final ***A1*** to be given, 21.4 (21.4099…) must be seen. Follow through within question part for final ***A1*** for a consistent comparison with their OX.

METHOD 2

sketch of triangle OXK with vertices, angles and lengths *(A1)*



51.1^o is smallest angle in triangle OXK *R1*

opposite side (OX) is smallest length *R1*

therefore Odette is closest *A1*

[4 marks]

(e) attempt to use length of arc formula *(M1)*

$\frac{135}{360} \times 2\pi \times 12$ *(A1)*

$28.3(m)$ $(9\pi, 28.2743...)$ (m) *A1*

[3 marks]

Total [17 marks]

Q16.

(a) continuous **A1**

[1 mark]

(b) $160-50-62-14-8$ **(M1)**

$(k=)\ 26$ **A1**

[2 marks]

(c) (i) $20 \le T < 40$ **A1**

(ii) 30 **A1**

[2 marks]

(d) 33.5 minutes **A2**

Note: ***FT*** from their value of k and their mid-interval value. Follow through from part (c)(ii) but only if mid-interval value lies in their interval.

[2 marks]

(e) 112 **A1**

[1 mark]

(f) $\frac{22}{160}$ $\left[0.138,\ 0.1375,\ 13.75\%,\ \frac{11}{80}\right]$ **A1A1**

Note: Award ***A1*** for correct numerator, ***A1*** for correct denominator.

[2 marks]

(g) 26 minutes **A1**

[1 mark]

(h) $50-16$ **(M1)**

Note: Award ***M1*** for both correct quartiles seen.

34 minutes **A1**

[2 marks]

(i) correct substitution into outlier formula **(M1)**

$50+1.5\times 34$

$=101$ **A1**

$92<101$ **OR** highest value on diagram <101 **R1**

not an outlier **AG**

Note: Award ***R1*** for their correct comparison. Follow through from their part (h).
Award ***R0*** if their conclusion is "it is an outlier", this contradicts Elsie's belief.

[3 marks]

(j) **EITHER**

the diagram is not symmetric or equivalent

e.g the median is not in the center of the box or

the lengths of the whiskers are (very) different or (positive or right) skew

OR

the mean and median are (very) different; **A1**

[1 mark]

Total [17 marks]

Q17.

(a) **EITHER**

$N = 2$
$PV = -37\,000$
$I\% = 6.4$
$P/Y = 1$
$C/Y = 4$ ***(M1)(A1)***

Note: Award ***M1*** for an attempt to use a financial app in their technology, award ***A1*** for all entries correct.

OR

$N = 8$
$PV = -37\,000$
$I\% = 6.4$
$P/Y = 4$
$C/Y = 4$ ***(M1)(A1)***

Note: Award ***M1*** for an attempt to use a financial app in their technology, award ***A1*** for all entries correct.

OR

$FV = 37\,000 \times \left(1 + \frac{6.4}{100 \times 4}\right)^{4 \times 2}$ ***(M1)(A1)***

Note: Award ***M1*** for substitution into compound interest formula, ***(A1)*** for correct substitution.

$= 42\,010$ AUD ***A1***

Note: Award ***(M1)(A1)A0*** for unsupported 42009.87.

[3 marks]

(b) **EITHER**

$PV = -37\,000$
$FV = 50\,000$
$I\% = 6.4$
$P/Y = 1$
$C/Y = 4$ ***(M1)(A1)***

Note: Award ***M1*** for an attempt to use a financial app in their technology, award ***A1*** for all entries correct. The final mark can still be awarded for the correct number of months (multiple of 3).

OR

$PV = -37\,000$
$FV = 50\,000$
$I\% = 6.4$
$P/Y = 4$
$C/Y = 4$ ***(M1)(A1)***

Note: Award ***M1*** for an attempt to use a financial app in their technology, award ***A1*** for all entries correct.

OR

$50000 < 37\,000 \times \left(1 + \frac{6.4}{100 \times 4}\right)^{4 \times n}$ **OR** $50\,000 < 37\,000 \times \left(1 + \frac{6.4}{100 \times 4}\right)^{n}$ ***(M1)(A1)***

Note: Award ***M1*** for the correct inequality, $50\,000$ and substituted compound interest formula. Allow an equation. Award ***A1*** for correct substitution.

THEN

$N = 4.74$ (years) $(4.74230...)$ **OR** $N = 18.9692...$ (quarters) ***(A1)***

$m = 57$ months ***A1***

Note: Award ***A1*** for rounding their m to the correct number of months. The final answer must be a multiple of 3. Follow through within this part.

[4 marks]

(c) $150\,000$ AUD ***A1***

[1 mark]

continued…

(d) (i) $120 \times 1700 - 150\,000$ ***(M1)***

$= 54\,000$ AUD ***A1***

(ii) $N = 120$
$PV = -150\,000$
$PMT = 1700$
$FV = 0$
$P/Y = 12$
$C/Y = 12$ ***(M1)(A1)***

Note: Award ***M1*** for an attempt to use a financial app in their technology or an attempt to use an annuity formula or $FV = 0$ seen. If a compound interest formula is equated to zero, award ***M1***, otherwise award ***M0*** for a substituted compound interest formula.
Award ***A1*** for all entries correct in financial app or correct substitution in annuity formula, but award ***A0*** for a substituted compound interest formula.
Follow through marks in part (d)(ii) are contingent on working seen.

$r = 6.46$ (%) (6.45779...) ***A1***

[5 marks]

(e) $N = 60$
$I = 6.46$ (6.45779...)
$PV = -150\,000$
$PMT = 1700$
$P/Y = 12$
$C/Y = 12$ ***(M1)(A1)***

Note: Award ***M1*** for an attempt to use a financial app in their technology or an attempt to use an annuity formula. Award ***(M0)*** for a substituted compound interest formula. Award ***A1*** for all entries correct. Follow through marks in part (e) are contingent on working seen.

$FV = 86\,973$ AUD ***A1***

[3 marks]

(f) $204\,000 - (60 \times 1700 + 86\,973)$ **OR** $204\,000 - 188\,973$ ***(M1)(M1)***

Note: Award ***M1*** for 60×1700. Award ***M1*** for subtracting their $(60 \times 1700 + 86\,973)$ from their $(204\,000)$. Award at most ***M1M0*** for their $204\,000 - (60 \times 1700)$ or ***M0M0*** for their $204\,000 - (86\,973)$. Follow through from parts (d)(i) and (e).
Follow through marks in part (f) are contingent on working seen.

15 027 AUD ***A1***

[3 marks]

Total [19 marks]

Q18.

(a) $(a =) 0$ ***A1***

[1 mark]

(b) $(1.39, 5.24)$ $((1.38672\ldots, 5.24025\ldots)$ ***A1A1***

Note: Award ***A1*** for each correct coordinate; do not accept 2 sf values. Award at most ***A0A1*** if parentheses are missing. Accept $x = 1.39$, $y = 5.24$.

[2 marks]

(c) any value greater than $5.24025\ldots$ ***A1***

Note: Accept a specific value **OR** a description of the correct interval for all values.

[1 mark]

(d) **METHOD 1**

attempt to relate gradient of function to graph of f ***R1***

e.g. the function is increasing at $x = -4$

$m > 0$ ***A1***

METHOD 2

attempt to find value of $f'(-4)$ ***R1***

$\left(= \frac{25}{8} = 3.125\right)$

$m > 0$ ***A1***

Note: The ***A1*** can only be awarded if the correct value of $f'(-4)$ or m is found

METHOD 3

attempt to substitute $(-4, -12.75)$ into equation of tangent

$-12.75 = m(-4) - \frac{1}{4}$ so $m = 3.125$ ***R1***

$m > 0$ ***A1***

Note: Do not award ***R0A1***.

[2 marks]

(e) (i) attempt to substitute $(0, -5)$ or $(3, 4.5)$ into $g(x)$ ***(M1)***

$-5 = k \times p^0 - 9$

$(k =) 4$ ***A1***

(ii) attempt to substitute $(3, 4.5)$ and their part (e)(i) into $g(x)$ ***(M1)***

$4.5 = 4 \times p^3 - 9$

$p^3 = 3.375$

$(p =) 1.5$ ***A1***

[4 marks]

(f) $y = -9$

A2

Note: Award ***A1*** for -9 seen, ***A2*** for a completely correct equation.
Condone $g(x) = -9$

[2 marks]

(g) $(x =) 4$ ***(M1)A1***

Note: Award ***M1*** for equating $f(x)$ to **their** $g(x)$
Award ***(M1)A0*** for the y-coordinate (11.25) as the answer or part of the answer (e.g. coordinates).
Award ***(M1)A0*** for an answer of $(x =) -2.39421\ldots$

[2 marks]

(h) **METHOD 1:**

$f(-1) = 0 \Rightarrow h(-1) = g(-1)$ (This justification could be graphical.) ***R1***

yes ***A1***

Note: Award ***R1*** for any reasoning based on the fact that -1 is the x-intercept of f.
Accept equivalent arguments in words. Do not award ***R0A1***.

METHOD 2:

$g(-1) = -\frac{19}{3}$ $(-6.33333\ldots)$

$h(x) = 3x - 1 + 4x^{-2} + 4 \times 1.5^x - 9$

$h(-1) = 3(-1) - 1 + 4(-1)^{-2} + 4 \times 1.5^{-1} - 9$

$h(-1) = -\frac{19}{3}$ $(-6.33333\ldots)$ ***R1***

yes ***A1***

Note: Award ***R1*** for showing that $g(-1) = -\frac{19}{3}$ and $h(-1) = -\frac{19}{3}$. Do not award ***R0A1***.

[2 marks]

[Total: 16 marks]

Q18.

(a) (i) **EITHER**

$115.5 = u_1 + (3-1)\times d \quad (115.5 = u_1 + 2d)$

$108 = u_1 + (8-1)\times d \quad (108 = u_1 + 7d)$ ***(M1)(A1)***

Note: Award ***M1*** for attempting to use the arithmetic sequence term formula, ***A1*** for both equations correct. Working for ***M1*** and ***A1*** can be found in parts (i) or (ii).

$(d = -1.5)$

1.5 (cups/day) ***A1***

Note: Answer must be written as a positive value to award ***A1***.

OR

$(d =) \ \dfrac{115.5-108}{5}$ ***(M1)(A1)***

Note: Award ***M1*** for attempting a calculation using the difference between term 3 and term 8; ***A1*** for a correct substitution.

$(d =)$ 1.5 (cups/day) ***A1***

(ii) $(u_1 =)$ 118.5 (cups) ***A1***

[4 marks]

(b) attempting to substitute their values into the term formula for arithmetic sequence equated to zero ***(M1)***

$0 = 118.5 + (n-1)\times(-1.5)$

$(n =)$ 80 days ***A1***

Note: Follow through from part (a) only if their answer is positive.

[2 marks]

(c) $(t_5 =) \ 625\times 1.064^{(5-1)}$ ***(M1)(A1)***

Note: Award ***M1*** for attempting to use the geometric sequence term formula; ***A1*** for a correct substitution

$ 801 ***A1***

Note: The answer must be rounded to a whole number to award the final ***A1***.

[3 marks]

(d) (i) $(S_{10} =)$ (\$) 8390 (8394.39...) ***A1***

(ii) **EITHER**

the total cost (of dog food) ***R1***
for 10 years beginning in 2021 **OR** 10 years before 2031 ***R1***

OR

the total cost (of dog food) ***R1***
from 2021 to 2030 (inclusive) **OR** from 2021 to (the start of) 2031 ***R1***

[3 marks]

(e) **EITHER**
According to the model, the cost of dog food per year will eventually be too high to keep a dog.
OR
The model does not necessarily consider changes in inflation rate.
OR
The model is appropriate as long as inflation increases at a similar rate.
OR
The model does not account for changes in the amount of food the dog eats as it ages/becomes ill/stops growing.
OR
The model is appropriate since dog food bags can only be bought in discrete quantities. ***R1***

Note: Accept reasonable answers commenting on the appropriateness of the model for the specific scenario. There should be a reference to the given context. A reference to the geometric model must be clear: either "model" is mentioned specifically, or other mathematical terms such as "increasing" or "discrete quantities" are seen. Do not accept a contextual argument in isolation, e.g. "The dog will eventually die".

[1 mark]
Total [13 marks]