QUESTION 1

    (a)   (i)   F   *(A1)*

           (ii)   T   *(A1)*

           (iii)   F   *(A1)*

           (iv)   F   *(A1)*   *(C4)*

    (b)   IQR $= 6 - 4$ *(M1)*

> **Note:** Award *(M1)* for identifying correct quartiles.

           IQR $= 2$ *(A1)(ft)*   *(C2)*

[6 marks]

QUESTION 2

    (a)   If the sun is shining then I will go swimming.   *(A1)(A1)*   *(C2)*

> **Note:** Award *(A1)* for "if…then" and *(A1)* for correct order.

    (b)   Either the sun is not shining or I will go swimming.   *(A1)(A1)*   *(C2)*

> **Note:** Award *(A1)* for both correct statements and *(A1)* for "either" "…or".

    (c)

p	q	$p \Rightarrow q$	$\neg p$	$\neg p \vee q$
T	T	T	**F**	T
T	F	F	**F**	F
F	T	T	**T**	T
F	F	T	**T**	T

                                                                           (A1)   *(C1)*

    (d)   They are (logically) equivalent.   *(A1)*   *(C1)*

> **Note:** Do not accept any other answers.

[6 marks]

QUESTION 3

(a) $u_{21} = 24 + (21-1)(16)$ *(M1)(A1)*

> **Note:** Award *(M1)* for correct substituted formula, *(A1)* for correct substitutions.

      $u_{21} = 344$ *(A1)*   *(C3)*

(b) $S_{31} = \dfrac{31}{2}\left[2(24) + (31-1)(16)\right]$ *(M1)(A1)*(ft)

> **Note:** Award *(M1)* for correct substituted formula, *(A1)*(ft) for correct substitutions.
> (ft) from their value for d.

      $S_{31} = 8184$ *(A1)*(ft)   *(C3)*

[6 marks]

QUESTION 4

(a)   6

      OR

      (0, 6)   *(A1)*   *(C1)*

(b) $\dfrac{(2-5)}{(8-2)}$ *(M1)*

> **Note:** Award *(M1)* for substitution in gradient formula.

      $= -\dfrac{1}{2}$ *(A1)*   *(C2)*

(c)   Angle clearly identified.   *(A1)*   *(C1)*

(d) $\tan\theta = \dfrac{1}{2}$ (or equivalent fraction)   *(M1)*

      $\theta = 26.6°$ *(A1)*(ft)   *(C2)*

> **Note:** (ft) from (b)
> Accept alternative correct trigonometrical methods.

[6 marks]

QUESTION 5

    (a) $(x-2)(x-4)$ *(A1)(A1)*   *(C2)*

    (b) $x=2,\ x=4$ *(A1)(ft)(A1)(ft)*   *(C2)*

    (c) $x=0.807,\ x=6.19$ *(A1)(A1)*   *(C2)*

> **Note:** Award maximum of *(A0)(A1)* if coordinate pairs given.

        OR

        (M1) for an attempt to solve $x^2-7x+5=0$ via formula with correct values
        substituted.   *(M1)*

$$x=\frac{7\pm\sqrt{29}}{2}$$
                                                        (A1)   *(C2)*

                                                          [6 marks]

QUESTION 6

    (a) $(3-1)(4-1)$ *(M1)*
            $=6$ *(A1)*   *(C2)*

    (b)   The preferred type of drink is **independent** of age.   *(A1)*   *(C1)*

> **Note:** For independent accept "not associated" but do not accept "not related" or
>   "not correlated"

    (c)   12.592 (12.6)   *(A1)*   *(C1)*

    (d)   Reject null hypothesis as critical value $<\chi^2_{calc}$ *(A1)(R1)*(ft)

> **Note:** (ft) from their value in (c).

        OR

        Reject null hypothesis as *p*-value <0.05 *(A1)(R1)*   *(C2)*

> **Notes:** Do not award *(A1)(R0)*.
>   Award the *(R1)* for comparison of correct values.

                                                           [6 marks]

QUESTION 7

(a) $x = 3$ *(A1)(A1)*   *(C2)*

Notes: Award *(A1)* for " $x =$ " *(A1)* for 3.   The mark for $x =$ is not awarded unless a constant is seen on the other side   of the equation.

(b) $(3, -14)$ (Accept $x = 3, y = -14$)   *(A1)(ft)(A1)*   *(C2)*

Note: Award *(A1)(A0)* for missing coordinate brackets.

(c) $y \geq -14$ *(A1)(A1)(ft)*   *(C2)*

Notes: Award *(A1)* for $y \geq$, *(A1)(ft)* for -14.   Accept alternative notation for intervals.

[6 marks]

QUESTION 8   *Financial penalty (FP) applies in parts (b) and (c)*

(a) $r = \dfrac{8320}{8000}$ (or equivalent)   *(M1)*

Note: Award *(M1)* for dividing correct terms.

$r = 1.04$ *(A1)*   *(C2)*

Notes: In (b) and (c) **(ft)** from candidate's *r*. Allow lists, graphs *etc.* as working in (b) and (c).

(b)   Fees $= 8000\,(1.04)^6$ *(M1)*

Note: Award *(M1)* for correct substitution into correct formula.

(FP)   Fees $= 10122.55$ USD (USD not required)   *(A1)***(ft)**   *(C2)*

Note: Special exception to the note above. Award maximum of *(M1)(A0)* if 5 is used as the power.

(c)   Total $= \dfrac{8000\left(1.04^8 - 1\right)}{1.04 - 1}$ *(M1)*

Notes: Award *(M1)* for correct substitution into correct formula. Give full credit for solution by lists.

(FP)   Total $= 73713.81$ USD (USD not required)   *(A1)***(ft)**   *(C2)*

[6 marks]

QUESTION 9

    (a) $180°$ *(A1)*   *(C1)*

    (b)   (i) $a = 3$ *(A1)*

           (ii) $b = 2$ *(A1)*

           (iii) $c = 1$ *(A1)*   *(C3)*

    (c)   2   *(M1)(A1)*   *(C2)*

> **Notes:** Award *(M1)* for line at $y = 3$ (with any domain).
>   Accept some indication of intersection seen on graph.
>   Award *(M1)(A0)* if solutions given $(x = 201$ and $x = 249)$.

                                                                     [6 marks]

QUESTION 10

    (a) $\dfrac{\sin A\hat{B}C}{13.4} = \dfrac{\sin 30°}{6.7}$ *(M1)(A1)*

> **Note:** Award *(M1)* for correct substituted formula, *(A1)* for correct substitution.

         $A\hat{B}C = 90°$ *(A1)*
         $A\hat{C}B = 60°$ *(A1)*(ft)   *(C4)*

> **Note:** Radians give no solution, award maximum *(M1)(A1)(A0)*.

    (b) $\dfrac{29 - 30}{30} \times 100$ *(M1)*

> **Note:** Award *(M1)* for correct substitution into correct formula.

        % error $= -3.33$ %   *(A1)*   *(C2)*

> **Notes:** Percentage symbol not required. Accept positive answer.

                                                                     [6 marks]

QUESTION 11

(a) $\dfrac{4}{24}$ $\left(\dfrac{1}{6}, 0.167, 16.7\%\right)$ *(A1)(A1)*   *(C2)*

Note: Award *(A1)* for numerator, *(A1)* for denominator.

(b) $\dfrac{7}{24}$ $(0.292, 29.2\ \%)$ *(A1)(A1)*(ft)   *(C2)*

Note: Award *(A1)*(ft) from the denominator used in (a).

(c) $\dfrac{3}{7}$ $(0.429, 42.9\ \%)$ *(A1)(A1)*(ft)   *(C2)*

Note: Award *(A1)* for numerator *(A1)*(ft) for denominator, (ft) from their numerator in (b).

[6 marks]

QUESTION 12

(a) $446.25 = \dfrac{C \times 2.5 \times 5}{100}$ *(M1)*

> **Note:** Award *(M1)* for the simple interest formula with values from question.

   $C = 3570$ AUD   *(A1)*   *(C2)*

(b) $446.25 = 5000\left(1 + \dfrac{2.5}{2(100)}\right)^{2n} - 5000$ *(M1)(A1)*

> **Notes:** Award *(M1)* for substitution into compound interest formula. Award *(A1)* for correct values.

   $5446.25 = 5000\left(1 + \dfrac{2.5}{2(100)}\right)^{2n}$ *(A1)*

   $n = 3.44$
   $n = 3.5$ *(A1)*

   OR

   $5446.25 = 5000\,(1.0125)^{2n}$ *(A1)(M1)(A1)*

> **Notes:** Award *(A1)* for 5446.25 seen.
>   Award *(M1)* for substitution into compound interest formula.
>   Award *(A1)* for correct values.

   $n = 3.44$ years
   3.5 years required   *(A1)*   *(C4)*

> **Notes:** For incorrect substitution into compound interest formula award at most
>   *(M1)(A0)(A1)(A0)*
>   Award *(A3)* for 3.44 seen without working.
>   Allow solution by lists. In this case
>   Award   *(A1)* for half year rate 1.25 % seen.
>   *(A1)* for 5446.25 seen
>   *(M1)* for at least 2 correct uses of multiplication by 1.0125
> $5000 \times 1.0125 = 5062.5$ and $5062.5 \times 1.0125 = 5125.78125$
>   *(A1)* $n = 3.5$
>   If yearly rate used then award *(A0)(A1)(M1)(A0)*

[6 marks]

QUESTION 13   *Unit penalty (UP) applies in parts (a) and (b)*

(a)   Volume of tennis ball $= \frac{4}{3}\pi 3.15^3$ *(M1)*

> **Note:**   Award *(M1)* for correct substitution into correct formula.

(UP)   Volume of tennis ball $= 131\,\text{cm}^3$ *(A1)*   *(C2)*

(b)   Volume of empty space $= \pi 3.2^2 \times 26 - 4 \times 130.9$ *(M1)(M1)(M1)*

> **Note:**   Award *(M1)* for correct substitution into cylinder formula, *(M1)* $4 \times$ their (a), *(M1)* for subtracting appropriate volumes.

(UP)   Volume of empty space $= 313\ \text{cm}^3$ *(A1)*(ft)   *(C4)*

> **Note:**   Accept $312\ \text{cm}^3$ with use of 131.

[6 marks]

QUESTION 14

(a) $p + q = 47$ *(A1)*

  $4p + q = 53$ *(A1)*   *(C2)*

(b)   Reasonable attempt to solve their equations   *(M1)*
  $p = 2, q = 45$ *(A1)*   *(C2)*

> **Note:**   Accept only the answers $p = 2, q = 45$.

(c) $C = 2 \times 2^{0.5\,(10)} + 45$ *(M1)*
  $C = 109$ *(A1)*(ft)   *(C2)*

> **Note:**   Award *(M1)* for substitution of 10 into the formula with their values of p and q.

[6 marks]

QUESTION 15

(a) $y = 13.5x + 4.5$ *(M1)*

Note: Award *(M1)* for $13.5x$ seen.

  gradient $= 13.5$ *(A1)*   *(C2)*

(b) $4x^3$ *(A1)*   *(C1)*

(c) (i) $4x^3 = 13.5$ *(M1)*

Note: Award *(M1)* for equating their answers to (a) and (b).

    $x = 1.5$ *(A1)*(ft)

  (ii) $\dfrac{81}{16}$ $(5.0625, 5.06)$ *(A1)*(ft)   *(C3)*

Note: Award *(A1)*(ft) for substitution of their (c)(i) into x^4 with working seen.

[6 marks]