

1. (a) 210 g **A1**
[1 mark]
- (b) 240 g **A1**
[1 mark]
- (c) $240 - 190$
 $= 50$ g **(M1)**
A1
[2 marks]
- (d) $240 + 1.5 \times (50)$
 $= 315$ g **M1**
A1
[2 marks]
- Total [6 marks]**

2. (a) $(d =) - 250$ **A1**
[1 mark]
- (b) $(u_{16} =) 6800 + (16 - 1)(- 250)$
 $(\yen) 3050$ **M1**
A1
[2 marks]
- (c) $(S_{16} =) \left(\frac{16}{2}\right)(2 \times 6800 + (16 - 1)(- 250)) \times 2$ **M1M1**

Note: Award **M1** for correct substitution into arithmetic series formula.
Award **M1** for multiplication by 2 seen.

OR

$$(S_{16} =) \left(\frac{16}{2}\right)(6800 + 3050) \times 2$$

M1M1

Note: Award **M1** for correct substitution into arithmetic series formula.
Award **M1** for multiplication by 2 seen.

$(\yen) 158\,000$ (157 600)

A1

[3 marks]

Total [6 marks]

3. (a) discrete

A1
[1 mark]

(b)
$$\frac{24 + 60 + 3k + 40 + 15 + 6}{88 + k} = 2$$

M1A1

Note: Award **M1** for substitution into the formula for the mean, award **A1** for a correct equation.

attempt to solve their equation

(M1)

$k = 31$

A1
[4 marks]

(c) systematic

A1
[1 mark]

Total [6 marks]

4. (a) 20

A1
[1 mark]

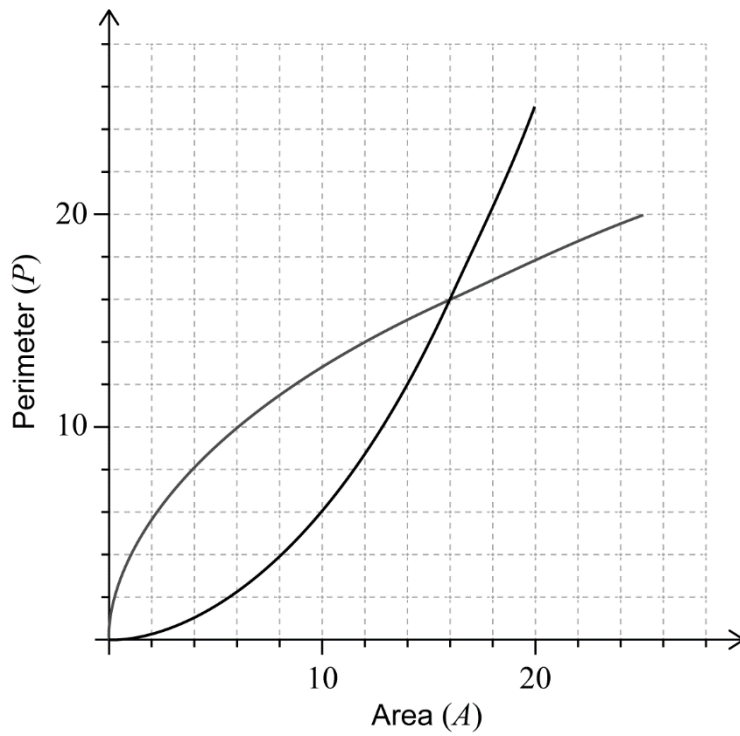
(b) $n = 20$

A1

Note: Follow through from part (a).

[1 mark]

(c)



(M1)A1A1

Note: Award **(M1)** for reflection in the line $P = A$, award **A1** for endpoint at $(20, 25)$, award **A1** for passing through $(16, 16)$.

[3 marks]

(d) when the perimeter is 8, the area is 4

A1
[1 mark]

Total [6 marks]

5. (a) (i) 1750 A1
- (ii) $1350 + 400(1.25)^{-5}$ (M1)
- = 1480 A1

Note: Accept 1481.

[3 marks]

- (b) $1400 = 1350 + 400(1.25)^{-t}$ (M1)
- 9.32 (days (9.31885...)) (days) A1
- [2 marks]

- (c) 1350 A1

Note: Accept 1351 as a valid interpretation of the model as $P = 1350$ is an asymptote.

[1 mark]

Total [6 marks]

6. (a) number of salad meals per week is independent of a person's position in the university A1

Note: Accept "not associated" instead of independent.

[1 mark]

- (b) 0.0201 (0.0201118...) A2
- [2 marks]

- (c) $0.0201 < 0.05$ R1
- the null hypothesis is rejected A1
- [2 marks]

Note: Award (R1) for a correct comparison of their p -value to the test level, award (A1) for the correct interpretation from that comparison. Do not award (R0)(A1).

Total [5 marks]

7. (a) $\frac{3-1}{7-3}$ (M1)
 = 0.5 A1
 [2 marks]

(b) $y-2 = -2(x-5)$ (A1)(M1)

Note: Award (A1) for their -2 seen, award (M1) for the correct substitution of (5, 2) and their normal gradient in equation of a line.

$2x + y - 12 = 0$ A1
 [3 marks]

- (c) every point in the cell is closer to E than any other snow shelter A1
 [1 mark]

Total [6 marks]

8. (a) $10\log_{10}(6.4 \times 10^{-3} \times 10^{12})$ (M1)
 = 98.1(dB) (98.06179...) A1
 [2 marks]

(b) $112 = 10\log_{10}(S \times 10^{12})$ (M1)
 $0.158(\text{W m}^{-2})(0.158489...(\text{W m}^{-2}))$ A1
 [2 marks]

Total [4 marks]

9. (a) (i) $\mu_1 - \mu_2 = 0$ **A1**
 (ii) $\mu_1 - \mu_2 \neq 0$ **A1**

Note: Accept equivalent statements in words.

[2 marks]

- (b) 0.296 (0.295739...) **A2**

[2 marks]

- (c) $0.296 > 0.1$ **R1**

fail to reject the null hypothesis, there is no difference between the mean height of male and female students

A1

Note: Award **(R1)** for a correct comparison of their p -value to the test level, award **(A1)** for the correct interpretation from that comparison. Do not award **R0A1**.

[2 marks]

Total [6 marks]

10. (a) $A = \int_0^2 (6 - 3x)(4 + x) dx$ **A1A1**

Note: Award **A1** for the limits $x = 0$, $x = 2$. Award **A1** for an integral of $f(x)$.

[2 marks]

- (b) 28 **A1**

[1 mark]

- (c) $28 = 0.5 \times a \times 10$ **M1**

$5.6 \left(\frac{28}{5} \right)$ **A1**

[2 marks]

Total [5 marks]

11. volume = $240\left(\pi \times 8.4^2 - \frac{1}{2} \times 8.4^2 \times 0.872664\dots\right)$ **M1M1M1**

Note: Award **M1** $240 \times \text{area}$, award **M1** for correctly substituting area sector formula, award **M1** for subtraction of their area of the sector from area of circle.

= 45800 (= 45811.96071) **A1**
Total [4 marks]

12. (a) $\frac{4}{18}\left(\frac{2}{9}\right)$ **A1**
[1 mark]

(b) $-3 \times \frac{1}{18} + (-1) \times \frac{4}{18} + 0 \times \frac{3}{18} + \dots + 5 \times \frac{7}{18}$ **(M1)**

Note: Award **(M1)** for their correct substitution into the formula for expected value.

= $1.83\left(\frac{33}{18}, 1.83333\dots\right)$ **A1**
[2 marks]

(c) $2 \times \frac{1}{18} \times \frac{3}{18}$ **(M1)(M1)**

Note: Award **(M1)** for $\frac{1}{18} \times \frac{3}{18}$, award **(M1)** for multiplying their product by 2.

= $\frac{1}{54}\left(\frac{6}{324}, 0.0185185\dots, 1.85\%\right)$ **A1**
[3 marks]

Total [6 marks]

13. (a) $\frac{6}{15} \left(0.4, \frac{2}{5} \right)$

A1

[1 mark]

(b) $P(X = 8)$

(M1)

Note: Award **(M1)** for evidence of recognizing binomial probability.

eg, $P(X = 8), X \sim B\left(20, \frac{6}{15}\right)$.

0.180 (0.179705...)

A1

[2 marks]

(c) $P(\text{male}) = \frac{9}{15} (0.6)$

A1

$P(X \leq 9) = 0.128 (0.127521...)$

(M1)A1

Note: Award **(M1)** for evidence of correct approach eg, $P(X \leq 9)$.

[3 marks]

Total [6 marks]

14. (a) $\frac{\sin \hat{CAB}}{6} = \frac{\sin 15^\circ}{4.5}$ **(M1)(A1)**

$\hat{CAB} = 20.2^\circ$ (20.187415...) **A1**

Note: Award **(M1)** for substituted sine rule formula and award **(A1)** for correct substitutions.

[3 marks]

(b) $\hat{CBD} = 20.2 + 15 = 35.2^\circ$ **A1**
(let X be the point on BD where Ollie activates the sensor)

$\tan 35.18741\dots^\circ = \frac{1.8}{BX}$ **(M1)**

Note: Award **A1** for their correct angle \hat{CBD} . Award **M1** for correctly substituted trigonometric formula.

$BX = 2.55285\dots$ **A1**

$5 - 2.55285\dots$ **(M1)**

$= 2.45$ (m) (2.44714...) **A1**

[5 marks]

Total [8 marks]