

End of year revision ANS

0 min
0 marks

1. (a) $a = 100$ $d = 25$
 $T_{17} = 100 + (17 - 1) \times 25$ (M1)
 $= \$500$ (A1) (C2)

(b) $S_n = \frac{n}{2}(a + l)$
 $S_{17} = \frac{17}{2}(100 + 500)$ (M1)
 $= \$5100$ (A1)

*Note: Allow follow through from candidate's answer for T_{17} ,
which is l*

OR

$$S_n = \frac{n}{2} \{2a + (n - 1)d\}$$
$$S_{17} = \frac{17}{2} \{2 \times 100 + (17 - 1) \times 25\}$$
$$= \$5100$$

(M1)
(A1) (C2)

OR

Table

2. (a) $4n - 3$ (A1)
 (b) 397 (A1)
 (c) $S_{100} = \frac{100}{2} [(2 \times 1) + (99 \times 4)]$ or $50(1 + 397)$ (M1)
 $= 19\,900$ (A1)

[4]

3. (a) $3 = 57 + (n - 1) \times (-2)$
OR
 $57 = 3 + (n - 1) \times (2)$ (A1)(M1)

Note: Award (A1) for 3 or 57 seen as u_n , (M1) for correctly substituted formula or list of values seen

$n = 28$ (A1) (C3)

(b) $S_{28} = \frac{28}{2} (57 + 3)$

OR

$S_{28} = \frac{28}{2} (2(57) + (28 - 1) \times -2)$

OR

$S_{28} = \frac{28}{2} (2(3) + (28 - 1) \times 2)$ (M1)(A1)(ft)

Note: (A1)(ft) for 28 seen.

Award (M1) for correctly substituted formula or list of values seen.

$S_{28} = 840$ (A1)(ft) (C3)

[6]

4. $\frac{\text{height}}{5.7} = \tan 42^\circ,$ (M1)

therefore height = $5.7 \tan 42^\circ$ (= 5.1323...cm) (A1)
or (G2)

Volume of prism = $\frac{5.7 \tan(42^\circ) \times 5.7 \times 8}{2}$ (M1)

= 117 cm^3 (3 s.f.) (A1)
or (G2)

Note: The only departures from the substituted volume formula allowed are those where the $5.7 \tan(42)$ is replaced with a value that the candidate seems to believe is the height. eg 5.7 repeated is a possibility. In such cases, award (M1)(A0).

[4]

5. *Note: Unit penalty (UP) applies in part (a)*

(a) $PB = \frac{1}{2} \sqrt{40^2 + 40^2} = \sqrt{800} = 28.28$ (28.3) (M1)(A1)

Note: Award (M1) for correct substitutions, (A1) for correct answer.

UP $OB = \sqrt{40^2 + 28.28^2} = 49.0 \text{ cm}$ ($\sqrt{2400}$ cm) (M1)(A1)(ft) (C4)

Note: Award (M1) for correct substitution, can (ft) from any answer to PB.

(b) $\sin^{-1}\left(\frac{40}{49}\right)$

OR

$\cos^{-1}\left(\frac{28.28}{49}\right)$

OR

$\tan^{-1}\left(\frac{40}{28.28}\right)$ (M1)

= 54.7 (54.8) (A1)(ft) (C2)

Note: Award (M1) for any correct trig. ratio. In radians = 0.616, award (M1)(A0).

Note: Common error: (a) $OB = \sqrt{40^2 + 20^2} = 44.7 \text{ cm}$.

Award (M0)(A0)(M1) (A1)(ft), and (b) angle $OBP = 63.4^\circ$ (63.5°)(M1)(A1)(ft).

[6]

6. Unit penalty (**UP**) applies in parts (a) and (b) in this question.

(a) $VM^2 = 13^2 - 5^2$ (M1)
UP $= 12 \text{ cm}$ (A1) (C2)

(b) $h^2 = 12^2 - 5^2$ (or equivalent) (M1)
UP $= 10.9 \text{ cm}$ (A1)(ft) (C2)

(c) $\cos \theta = \frac{5}{12}$ (or equivalent) (M1)
 $\theta = 65.4^\circ$ (A1)(ft) (C2)

Note: Accept $\theta = 65.3^\circ$ (use of 10.9 with sine ratio).

[6]

7. (a) 0.965 (A1) (C1)

(b) $y = 1.15x + 0.976$
 (A1) for 1.15x (A1) for +0.976 (A1)(A1) (C2)

(c) $y = 1.15(7) + 0.976$ (M1)
 Chemistry = 9.03 (accept 9) (A1)(ft) (C2)

Note: Follow through from candidate's answer to (b) even if no working is seen. Award (A2)(ft).

(d) the correlation coefficient is close to 1
OR strongly correlated variables
OR 7 lies within the range of physics marks. (R1) (C1)

[6]

8. (a) Eye colour and gender are independent.

OR

There is no relationship (association) between eye colour and gender. (A1) 1

(b) $(2 - 1)(3 - 1)$ (M1)
 $= 2$ (AG) 1

(c) 5.991 (5.99) (A1) 1

(d) 4.48 (G2) 2

(e) For comparing χ^2 test statistic with χ^2 critical value (A1)

No, eye colour is not related to gender

χ^2 test statistic < χ^2 critical value (R1)

OR

For comparing their p -value with 0.05

No, eye colour is not related to gender (A1)

p -value of 0.106 > 0.05 (R1) 2

[7]

9. (a) Choice of music is independent of age. (A1) (C1)

(b) $(3 - 1)(3 - 1)$

= 4

(A1) (C1)

(c) $\chi^2 = 51.6$

(A2)

Note: 52 is an accuracy penalty (A1)(A0)(AP). (C2)

(d) p -value < 0.05 for 5% level of significance (R1)(ft)

or $51.6 > \chi^2_{crit}$ (R1)(ft)

Reject the null hypothesis (*do not accept the null hypothesis*). (A1)(ft)

Note: Do not award (R0)(A1). (C2)

[6]

10. (a) $\frac{7+4+5+4+8+T+14+4}{8} = 7$ (A1)(A1)

Note: Award (A1) for sum +T, (A1) for 56 or 7×8 or 8 in the denominator and 7 seen.

$T = 10$ (A1) (C3)

(b) 4 (A1) (C1)

(c) 4, 4, 4, 5, 7, 8, 10, 14 (M1)

Note: Award (M1) for arranging their numbers in order.

Median = 6 (A1)(ft) (C2)

[6]

11. (a) Gradient = $\frac{(5-1)}{(4-2)}$ (M1)

Note: Award (M1) for correct substitution in the gradient formula.

= 2 (A1) (C2)

(b) Midpoint = (3, 3) (accept $x = 3, y = 3$) (A1) (C1)

(c) Gradient of perpendicular = $-\frac{1}{2}$ (A1)(ft)

$y = -\frac{1}{2}x + c$ (M1)

$3 = -\frac{1}{2} \times 3 + c$

$c = 4.5$

$y = -0.5x + 4.5$ (A1)(ft)

OR

$y - 3 = -0.5(x - 3)$ (A1)(A1)(ft)

Note: Award (A1) for -0.5 , (A1) for both threes.

OR

$2y + x = 9$ (A1)(A1)(ft) (C3)

Note: Award (A1) for 2, (A1) for 9.

[6]

12. *Unit penalty applies in parts (a) and (d)*

UP (a) 61 kg (A1) (C1)

(b) 66 – 52 (A1)
= 14 (A1)(ft) (C2)

Note: Award (A1) for identifying quartiles, (A1)(ft) for correct subtraction of their quartiles.

(c) 20 (A1) (C1)

(d) $\frac{49.5 \times 20 + 56.5 \times 20}{40}$ (M1)

Note: Award (M1) for multiplication of midpoints by frequencies.

UP = 53 kg (A1) (C2)

[6]

13. (a) -2 (A1) (C1)

Note: Accept (0, -2)

(b) $-\frac{1}{2}$ (A1) (C1)

(c) 2 (A1)(ft) (C1)

Note: Follow through from their answer to part (b).

(d) $y = 2x + c$ (can be implied)
 $7 = 2 \times 3 + c$ (M1)
 $c = 1$ (A1)(ft)
 $y = 2x + 1$

Notes: Award (M1) for substitution of (3, 7), (A1)(ft) for c. Follow through from their answer to part (c).

OR

$y - 7 = 2(x - 3)$ (M1)(M1)

Note: Award (M1) for substitution of their answer to part (c), (M1) for substitution of (3, 7).

$2x - y + 1 = 0$ **or** $-2x + y - 1 = 0$ (A1)(ft) (C3)

Note: Award (A1)(ft) for their equation in the stated form.

[6]

14. (a) $\frac{8-4}{5-(-1)}$ (M1)

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

$\frac{2}{3}\left(\frac{4}{6}, 0.667\right)$ (A1) (C2)

(b) $y = \frac{2}{3}x + c$ (A1)(ft)

Note: Award (A1)(ft) for their gradient substituted in their equation.

$y = \frac{2}{3}x + \frac{14}{3}$ (A1)(ft) (C2)

*Notes: Award (A1)(ft) for their correct equation.
Accept any equivalent form.
Accept decimal equivalents for coefficients to 3 sf.*

OR

$y - y_1 = (x - x_1)$ (A1)(ft)

Note: Award (A1)(ft) for their gradient substituted in the equation.

$y - 4 = \frac{2}{3}(x + 1)$ **OR** $y - 8 = \frac{2}{3}(x - 5)$ (A1)(ft) (C2)

Note: Award (A1)(ft) for correct equation.

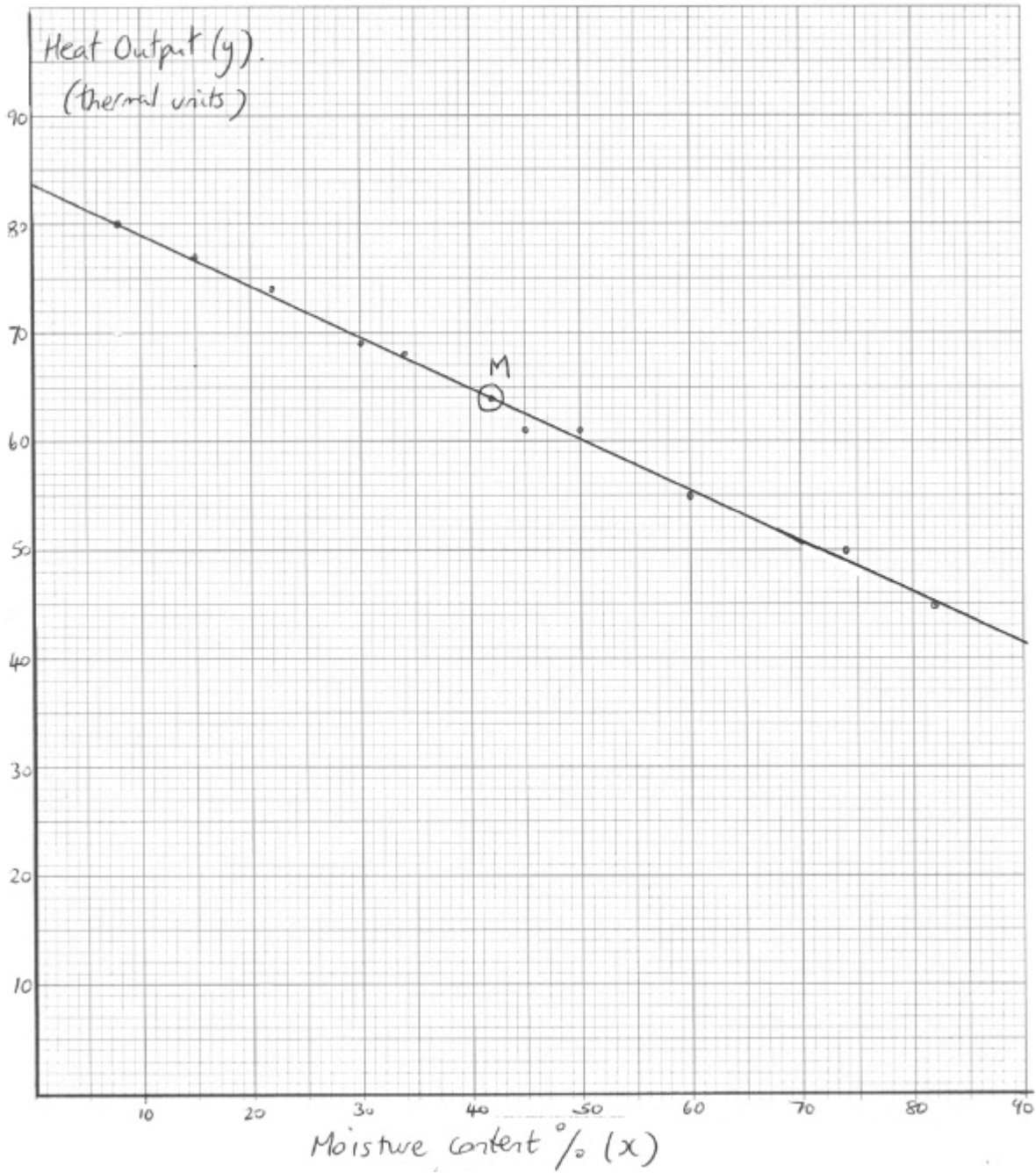
(c) $y = \frac{2}{3} \times 8 + \frac{14}{3}$ **OR** $y - 4 = \frac{2}{3}(8 + 1)$ **OR** $y - 8 = \frac{2}{3}(8 - 5)$ (M1)

Note: Award (M1) for substitution of $x = 8$ into their equation.

$y = 10$ (10.0) (A1)(ft) (C2)

Note: Follow through from their answer to part (b).

15. (a)



(A1) for correct scales and labels

(A3) for all ten points plotted correctly

(A2) for eight or nine points plotted correctly

(A1) for six or seven points plotted correctly

(A4)

Note: Award at most (A0)(A3) if axes reversed.

(b) (i) $\bar{x} = 42$

(A1)

(ii) $\bar{y} = 64$

(A1)

- (c) (\bar{x}, \bar{y}) plotted on graph and labelled, M (A1)(ft)(A1)

Note: Award (A1)(ft) for position, (A1) for label.

- (d) -0.998 (G2)

Note: Award (G1) for correct sign, (G1) for correct absolute value.

- (e) line on graph (A1)(ft)(A1)

Notes: Award (A1)(ft) for line through their M, (A1) for approximately correct intercept (allow between 83 and 85). It is not necessary that the line is seen to intersect the y-axis. The line must be straight for any mark to be awarded.

- (f) $y = -0.470(25) + 83.7$ (M1)

Note: Award (M1) for substitution into formula or some indication of method on their graph. $y = -0.470(0.25) + 83.7$ is incorrect.

$= 72.0$ (accept 71.95 and 72) (A1)(ft)(G2)

Note: Follow through from graph only if they show working on their graph.

Accept 72 ± 0.5 .

- (g) Yes since 25 % lies within the data set and r is close to -1 (R1)(A1)

Note: Accept Yes, since r is close to -1

Note: Do not award (R0)(A1).

[16]

16. (a) $\frac{0 \times 16 + 1 \times 22 + 2 \times 19}{80}$ (M1)

Note: Award (M1) for substituting correct values into mean formula.

1.75 (A1) (C2)

- (b) An attempt to enumerate the number of goals scored. (M1)

2 (A1) (C2)

(c) $\frac{2-1.75}{1.75} \times 100$ (M1)

14.3 % (A1)(ft) (C2)

*Notes: Award (M1) for correctly substituted % error formula.
% sign not required.*

Follow through from their answer to part (a).

If 100 is missing and answer incorrect award (M0)(A0).

*If 100 is missing and answer incorrectly rounded award (M1)
(A1)(ft)(AP).*

[6]

17. (a) $4a + 2b = 20$

$a + b = 8$

(A1)

$a - b = -4$

(A1) (C2)

Note: Award (A1)(A1) for any two of the given or equivalent equations.

(b) (i) $a = 2$

(A1)(ft)

(ii) $b = 6$

(A1)(ft) (C2)

Note: Follow through from their (a).

(c) $x = -\frac{6}{2(2)}$

(M1)

Note: Award (M1) for correct substitution in correct formula.

$= -1.5$

(A1)(ft) (C2)

[6]

18. (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)

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

[6]

19. (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]

20. (a) $-4, -3, -2, -1, 0, 1, 2$ (A1) (C1)

Note: Award (A1) for correct numbers, do not penalise if braces, brackets or parentheses seen.

(b) $\frac{4}{7}$ (0.571, 57.1%) (A1)(ft)(A1)(ft) (C2)

*Notes: Award (A1)(ft) for numerator, (A1)(ft) for denominator.
Follow through from part (a).*

Note: There is no further penalty in parts (c) and (d) for use of denominator consistent with that in part (b).

(c) $\frac{1}{7}$ (0.143, 14.3%) (A1)(ft) (C1)

Note: Follow through from part (a).

(d) $\frac{1}{7}$ (0.143, 14.3%) (A1)(ft)(A1)(ft) (C2)

Note: Award (A1)(ft) for numerator, (A1)(ft) for denominator.
Follow through from part (a).

[6]

21. (a) 1.265×10^{-1} (A1)(A1)(ft) (C2)

Note: Exact answer, i.e **not** to 3 s.f. is required for first (A1).
Can (ft) the power from wrong magnitude coefficient.

(b) 0.13 (1.3×10^{-1}) (A1)(ft) (C1)

(c) $\frac{0.13 - 0.1265}{0.1265} \times 100\%$ (M1)(A1)(ft)

= 2.77% (A1)(ft) (C3)

Notes: Award (M1) for substituting numbers into the formula, (A1) for substitution of the correct numbers. The answer must be a percentage for award of the second (A1).

In this session, allow the formula with absolute value taken and 100 missing, with answer 0.0277. Note: this instruction is designed to address the problem that an old, incorrect version of the formula booklet was used by some schools.

[6]

22. (a) $\frac{4.24}{256} = 0.0165625$ (M2)(A2) (C4)

(b) 0.0166 (A2) (C2)

(c) 1.66×10^{-2} (A1)(A1) (C2)

Note: Award (A1) for 1.66, (A1) for -2 .

[8]

23. (a) $\frac{\sin \hat{A}BC}{13.4} = \frac{\sin 30^\circ}{6.7}$ (M1)(A1)

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

$\hat{A}BC = 90^\circ$ (A1)

$\hat{A}CB = 60^\circ$ (A1)(ft) (C4)

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

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

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

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

Note: Percentage symbol not required. Accept positive answer.

[6]

24. *Note: Unit penalty (UP) applies in parts (b)(c) and (e)*

(a) $\frac{\sin BCA}{35} = \frac{\sin 105^\circ}{80}$ (M1)(A1)

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

$\hat{B}CA = 25.0^\circ$ (A1)(G2)

(b) Length BD = 40 m (A1)

Angle ABC = $180^\circ - 105^\circ - 25^\circ = 50^\circ$ (A1)(ft)

Note: (ft) from their answer to (a).

$AD^2 = 35^2 + 40^2 - (2 \times 35 \times 40 \times \cos 50^\circ)$ (M1)(A1)(ft)

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

UP AD = 32.0m (A1)(ft)(G3)

Notes: If 80 is used for BD award at most (A0)(A1)(ft)(M1)(A1)(ft)(A1)(ft) for an answer of 63.4 m. If the angle ABC is incorrectly calculated in this part award at most (A1)(A0)(M1)(A1)(ft)(A1)(ft). If angle BCA is used award at most (A1)(A0)(M1)(A0)(A0).

(c) length of fence = $35 + 40 + 32$ (M1)
 UP = 107m (A1)(ft)(G2)

Note: (M1) for adding 35 + 40 + their (b).

(d) cost per metre = $\frac{802.50}{107}$ (M1)

Note: Award (M1) for dividing 802.50 by their (c).

cost per metre = 7.50 USD (7.5 USD) (USD not required) (A1)(ft)(G2)

(e) Area of ABD = $\frac{1}{2} \times 35 \times 40 \times \sin 50^\circ$ (M1)
 UP = 536.2311102 (A1)(ft)
 = 536m² (A1)(ft)(G2)

Note: Award (M1) for correct substituted formula, (A1)(ft) for correct substitution, (ft) from their value of BD and their angle ABC in (b).

(f) Volume = 0.03×536 (A1)(M1)
 = 16.08
 = 16.1 (A1)(ft)(G2)

Note: Award (A1) for 0.03, (M1) for correct formula. (ft) from their (e). If 3 is used award at most (A0)(M1)(A0).

[18]

25. Unit penalty (UP) is applicable in question part (a) **only**.

(a) $AC^2 = 625^2 + 986^2 - 2 \times 625 \times 986 \times \cos 102^\circ$ (M1)(A1)
 (= 1619072.159)

AC = 1272.43

UP = 1270m (A1) (C3)

(b) $\frac{986}{\sin A} = \frac{1270}{\sin 102^\circ}$

(M1)(A1)(ft)

$A = 49.4^\circ$

(A1)(ft)

OR

$\frac{986}{\sin A} = \frac{1272.43}{\sin 102^\circ}$

(M1)(A1)(ft)

$A = 49.3^\circ$

(A1)(ft)

OR

$\cos A = \left(\frac{625^2 + 1270^2 - 986^2}{2 \times 625 \times 1270} \right)$

(M1)(A1)(ft)

$A = 49.5^\circ$

(A1)(ft) (C3)

[6]