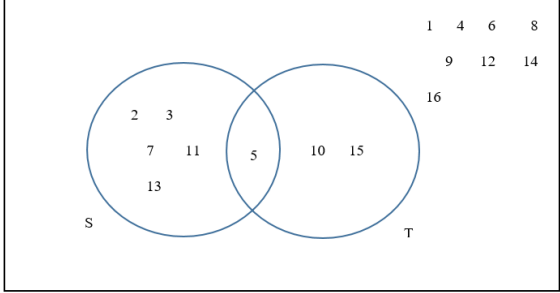
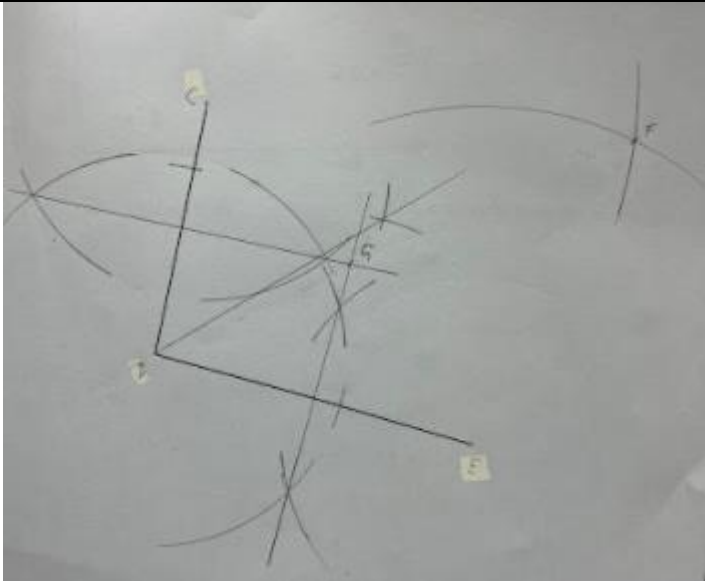


2021 O-LEVEL MATHEMATICS – PAPER 1 (ANSWER KEY)

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|----|--|--|
| 1a | 0.705 x 10 | B1 (Accept any accuracy more than 3 s.f. rounded or truncated from 0.7048119702) |
| 1b | $-\frac{8}{9}x, -0.1x, x, \frac{9}{8}x$ | B1 |
| 2 | $18 / 2 = 9$ $11 / 2 = 5R....$ $48 / 2 = 24$ $9 \times 5 \times 24$ $= 1080$ | M1 for getting 9, 5 and 24 A1 |
| 3 | $\frac{1}{2(x-5)} + \frac{2}{(5-x)}$ $= \frac{1}{2(x-5)} + \frac{4}{2(5-x)}$ $= \frac{1}{2(x-5)} - \frac{4}{2(x-5)}$ $= \frac{-3}{2(x-5)}$ | M1 M1 A1 |
| 4 | At y = 0 $0 = -(x+2)(2x-3)$ $(x+2) = 0$ or $(2x-3) = 0$ Therefore x = -2 or x = $\frac{3}{2}$ Ans: (-2, 0) A1 , ($\frac{3}{2}$, 0) A1 | M1 M1 |
| 5a | 36.75km | A1 |
| 5b | $\frac{16}{24}$ min = 40min Total dist / Total time = $\frac{36.75+16}{2.416667}$ $= 21.4$ (3sf) | M1 M1 A1 |
| 6 | $\sqrt[3]{\left(\frac{u^{-3}v}{v^2}\right)^{-1}} = u^{n+2}v^m$ $\left(\frac{u^{-3}v}{v^2}\right)^{-\frac{1}{3}} = u^{n+2}v^m$ $u^{-3 \times \frac{1}{3}} v^{2 \times \frac{-1}{3}} = u^{n+2}v^m$ $n = -3 \times \frac{1}{3} - 2 = -3$ $m = 2 \times \frac{-1}{3} = -\frac{2}{3}$ | M1 M1 A1 A1 |

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| 7 | $-20 < 14 - 4x < 2$ $\begin{array}{ll} -20 < 14 - 4x & 14 - 4x < 2 \\ -17 < -2x & -4x < -12 \\ \frac{17}{2} > x & x > 3 \end{array}$ $3 < x < \frac{17}{2}$ | <p>M1, M1 (for each inequality)</p> <p>A1</p> |
| 8a | $y = \sqrt{\frac{2x}{x+5}}$ $y^2(x+5) = 2x$ $y^2x + 5y^2 = 2x$ $x(y^2-2) = -5y^2$ $x = \frac{-5y^2}{y^2-2}$ | <p>M1</p> <p>M1 (factorise x)</p> <p>A1</p> |
| 8b | -10 | A1 |
| 9a | $1 \text{ cm} = \frac{7500}{300} \text{ km}$ $\sqrt[2]{1} \text{ cm} : \sqrt[2]{25} \text{ km}$ $1 : 5000, n = 5000$ | <p>M1</p> <p>A1</p> |
| 9b | 6.2cm | A1 |
| 10 | $\frac{4}{3}x = \frac{107}{100}x + 316$ $\frac{79}{300}x = 316$ $x = 1200$ | <p>M1</p> <p>M1</p> <p>A1</p> |
| 11a | $3a^2 - ab - bc + 3ac.$ $= a(3a - b) + c(3a - b)$ $= (a + c)(3a - b)$ | <p>M1</p> <p>A1</p> |
| 11b | $(p^2 - q)(p^2 + q) - 4(p^2 + q)^2$ $= p^4 - q^2 - 4[p^4 + 2p^2q + q^2]$ $= p^4 - q^2 - 4p^4 - 8p^2q - 4q^2$ $= -3p^4 - 5q^2 - 8p^2q$ | <p>M1(expansion of the brackets)</p> <p>M1</p> <p>A1</p> |
| 12a | $(2p - q)^2 = 4p^2 - 2pq + q^2$ | A1 |
| 12b | $(-8)^2 = 40 - 2pq$ $2pq = 104$ $pq = 104/2$ $pq = 72$ | <p>M1 (substitute in correctly)</p> <p>M1</p> <p>A1</p> |

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|-----|---|---|
| 13 | $64k^2 - 16k + 1 + 3$ $= 4(16k^2 - 4k + 1)$ | M1 A1 |
| 14a | $y = k \sqrt[3]{x}$ $k = 0.5$ $y = 0.5 \sqrt[3]{x}$ | M1 A1 |
| 14b | 125 | A1 |
| 14c | $y = 0.5x(4y + 1)$ $y = 2y + 0.5$ $y = -0.5$ | M1 A1 |
| 15a | $5y = 6x + 2$ $4y + 1 = 7x - y$ | M1 M1 |
| 15b | $x = 3$ $y = 4$ | A1 A1 |
| 15c | 140 cm ² | A1 |
| 16a | | B1 (correct shape seen) B1 (Maximum point) B1 (all 3 intercepts labelled, exact x intercepts) |
| 16b | $x = -1$ | A1 |
| 16c | $y = 4.5$ | A1 |
| 17a | 4cm | A1 |
| 17b | 95° | A1 |
| 17c | $WZ = \sqrt{25 + 25 - 2(5)(5)\cos 99^\circ}$ $WZ = 7.60$ (3sf) | M1 A1 |
| 18 | Angle ABC = $180^\circ(6-2)/6$ Angle ABC = 120° $\sqrt{75} = \sqrt{AB^2 + AB^2 - 2(AB^2)\cos 120^\circ}$ AB = 5cm | M1 M1 M1 (trigo ratio also award M1) A1 |

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| 19a | 162 | A1 |
| 19b | $\begin{aligned} \text{IQR} &= 168 - 154 \\ &= 14 \end{aligned}$ | M1 A1 |
| 20 | The value in 2016 is an outlier, it is much greater compared to the other years and will push the mean to be greater. | A1 |
| 21 | ξ  | M1 – elements in S and T are correct M1 – elements outside of S and T are correct |
| 21b | | A1 |
| 21c | {1, 4, 6, 8, 9, 10, 12, 14, 15, 16} | A1 |
| 22a | 10s | A1 |
| 22b | $\frac{40 - v}{15 - 18} = \frac{40 - 0}{15 - 25}$ $v = 28m/s$ | M1 A1 |
| 23 |  | |