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| Question | | Working | Answer | Mark | Notes |
| 1 | a | 40 TJ = 40 × 1012 = 4× 1013 so 40 TJ is less | 3 × 1014 is larger | 2 | M1 for 40 × 1012 A1 for 4× 1013 and decision |
|  | bi  ii | *E* = 10(4.8+1.5 ×8.35) = 1017.325 | 2.1×1017 J  50 megatons | 4 | M1 for substitution A1 awrt 2.1×1017 J  A1 48 - 52 megatons oe ft  B1 Convert from |
|  | c | =  so  Or just selects two values that differ by 1 | 32 times | 3 | M1 for oe A1 for  A1 accept 31.5 times |
| 2 | ai | P 180 ÷ 7.5 = 24 S 180 ÷ 4 = 45 | 21 s | 2 | M1 for 330 ÷ 11 = 30 or 330 ÷ 3 = 110 A1 for 80 |
|  | ii | Delay is (60 − 48) + 16 = 28 s  Distance = | 240 km | 3 | M1 for a correct method to find the time delay M1 for a correct method to find the distance  A1 cao |
|  | b | *v* = = 171.5 m/s  Duration of journey = 17000×1000 ÷171.5=99146 s  99125 ÷ 60 = 1652 m 05 s  1652 ÷ 60 = 27 h 32m  14:46 - 12 + 27:32 = 30:18 | 06:18  12th March | 5 | M1 for correct substitution  M1 for use of T = D ÷ S M1 for correct method to convert duration to hr and min  M1 for correct method to convert to local Chile time A1 06:10 - 06:30 12th March |
| 3 | a | *y* = 4.95 | 89000 - 100000 | 2 | M1 for 4.9 – 5 A1 for 89000 – 100000 |

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| Mathematics in Context - Earthquakes | | | | | |
| Question | | Working | Answer | Mark | Notes |
|  | ii | Gradient = = = −1.018  Means  *a* = = 3.242 − 6× −1.018 = 9.35 | *a* = 9.35 *b*= −1.018 | 4 | M1 for correct substitution into formula for gradient  A1 gradient in the interval [−1.0 , −1.02]  M1 for use of correct method to find intercept  A1 9.3 - 9.4 ft value of '*b*' |
|  | b(i)  (ii) | = 1.54 (every 10 years)  The values of the magnitude used are outside the range of the magnitudes and so should be treated with caution | 1.98 × 105  1 every 6.5 years | 6 | M1 (=1.98×106)  M1 '1.98×106 ÷10  A1 ft answers to 5  M1  A1 ft answers to 5  B1 for suitable comment |
| 4 | (a) |  | The is no correlation between magnitude and cost  The value at $240 billion is an outlier | 2 | B1 first relevant comment  B1 second relevant comment |
|  | (b)(i)  (ii) | SD = | 67.1 ($billion)  The standard deviation would reduce | 3 | M1 for substitution into the formula  A1 67 - 67.2 ($billion)  B1 The standard deviation would reduce oe |