**ALL questions should be attempted.**

### Marks

1. E = mc2

Find the value of E Find the value of E when m = 3.6 x 10-2 and c = 3 x 108

Give your answer in **scientific notation. 2**

1. Evaluate 12 + 18 ÷ 3 – 4 **2**
2. ** 2**
3. The population of a city is increasing at a steady rate of 2⋅7% p.a.

The present population is 648 000.

What is the expected population in 2 years time?

Give your answer correct to 3 significant figures. **3**

B

O

A

60°

18 cm

1. A circle, centre O, has radius 18 cm.

∠AOB = 60° .

Calculate the perimeter of the shaded sector AOB.

**3**

1. The number of missed hospital appointments over a period of 21 days were:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 32 | 29 | 14 | 16 | 23 | 10 | 18 |
|  |  |  |  |  |  |  |
| 26 | 27 | 17 | 11 | 21 | 17 | 25 |
|  |  |  |  |  |  |  |
| 6 | 21 | 19 | 16 | 22 | 15 | 31 |
|  |  |  |  |  |  |  |

1. Construct an ordered stem-and-leaf diagram to illustrate this information. **3**
2. Hence, or otherwise, write down the lower quartile, median and upper quartile of the data. **3**
3. Calculate the semi-interquartile range  **2**

**9.** (a) Multiply out the brackets and collect like terms.

(i) (*x* + 4)2 **2**

(ii) (*x* + 2)(*x*2 – 3*x* + 1) **3**

(b) Factorise 2*x*2 + 5*x* – 12 **2**

**10.** At a party, Peter bought 3 cans of cola and 2 bottles of orange juice costing a total of £2.55

1. Let *x* be the cost of a can of cola, and let *y* be the cost of a bottle of orange juice. Write down an equation to illustrate this. **1**

Later, Billy bought 2 cans of cola and 3 bottles of orange juice and was charged £2 70.

**(b)** Construct a second equation to illustrate this. **1**

**(c)** Calculate the cost of a can of cola and the cost of a bottle of orange juice. **4**

|  |  |  |
| --- | --- | --- |
| Qu | Answer and Marks | Examples of Evidence |
| **1** | **ans : 3.24 x 1015 2 marks**  •1 substitutes into equation  •2 calculates to answer | •1 3.6 x 10-2 x (3 x 108)2  •2  3.24 x 1015 |
| **2a** | **ans : 14 2 marks**  •1 division calculated first (BIDMAS)  •2 calculates answer | •1 12 + 6 - 4  •2 14 |
| **3** | **ans :**  **2 5/6** **2 marks**  •1 know to multiply by reciprocal  •2 calculates answer | •1 17/8 x 4/3  •2 2 5/6 |
| **4** | **ans : 683000 3 marks**  •1 multiplier  •2 calculate population  •3 round to 2 sig. fig. | •1 1.0272  •2 683464  •3 683000 |
| **5a** | **ans : 54.8 m2 3 marks**  •1 Identifies angle fraction  •2 Calculates arc length  •3 Calculates perimeter | •1  •2  arc = × 2 x  × 18 = 18.8 m    •3 18.8 + 18 + 18 = 54.8 |

|  |  |  |
| --- | --- | --- |
| Qu | Answer and Marks | Examples of Evidence |
| **6a**  **6b**  **6c** | **ans 3 marks**  •1 start to plot (5 points plotted correctly)  •2 complete graph (all points plotted correctly)  •3 title, key and number of missed appointments stated  **ans 15.5, 19, 25.5 3 marks**  •1 lower quartile stated correctly  •2 median stated correctly  •3 upper quartile stated correctly  **ans 5 2 marks**  •1 know how to calculate semi-interquartile range  •2 calculate correctly | •1  •2    •3 appropriate title, key and n=21  •1 15.5  •2 19  •3 25.5  •1 (25.5-15.5)/2  •2 5 |
| **9a (i)**  **(ii)**  **9b** | **ans : x² + 8x +16 2 marks**  •1 expands brackets  •2 collects ‘like’ terms  **ans: x3 - x² - 5x +2 2 marks**  •1  multiply second bracket by ‘x’  •2 multiply second bracket by ‘2’  •3 collects like terms  **ans: (2*x* - 3 ) (*x* + 4 ) 2 marks**  •1 finds factors that multiply to give 2*x*2 and 12  •2 find terms to add to give +5*x* | •1 x² + 4x + 4x + 16  •**2** x² + 8x + 16  •1 x3 – 3x2 + x  •2 2x² - 6x + 2  •3 x3 – x² - 5x + 2  •1 finds (2*x*…)(*x*.…) and (….3)(…. 4)  •2 finds correct signs to give + 5*x* |
| **10a**  **10b**  **10c** | **ans :  3x + 2y = 2.55 1 mark**  •1 Correct equation  **ans : 2x + 3y = 2.70 1 mark**  •1 Second equation  **ans : can cola = £0.45 4 marks**  **bottle juice = £ 0.60**  •1 Evidence of starting to solve simultaneous equations multiply one equation  •2 Find second equation multiplied  •3 Find first variable  •4 Find second variable **and** communication | •1 3x + 2y = 2.55  •1 2x + 3y = 2.70  •1 9x + 6y = 7.65  •2 4x + 6y = 5.40  •3 x = 0.45  •4 y = 0.60 **and**  Can cola= £0.45, Bottle juice = £0.60 |