| | Answer all the questions. | | |
|---|---|--|--|
| 1 | Solve $\frac{3}{-} + 12 - 5$ | | |
| I | $\frac{112-5}{x}$ | | |
| | $\frac{3}{x} = -7$ | | |
| | $x = -\frac{3}{7}$ | | |
| | Answer., $x = -\frac{3}{2}$ | | |
| | 7 | | |
| 2 | Factorise completely $3ax^2 - 2bx^2 - 3a + 2b$. | | |
| | $= x^2(3a - 2b) - (3a - 2b)$ | | |
| | $=(3a-2b)(x^2-1)$ | | |
| | =(3a-2b)(x-1)(x+1) | | |
| | | | |
| | Answer $(3a-2b)(x-1)(x+1)[3]$ | | |
| | | | |
| 3 | Solve the inequality $-7 \le 9 - 2x < 3$. | | |
| | $-7 \le 9 - 2x$ and $9 - 2x < 3$ | | |
| | $2x \le 16 \qquad -2x < -6$ $x \le 8 \qquad x > 3$ | | |
| | $2 + 1 \leq 9$ | | |
| | $3 < x \le 8$ | | |
| | $Answer(\mathbf{a}) 3 < r \le 8 $ [2] | | |
| | $1113WCF(\mathbf{u})5 < x \ge 0$ | | |
| 4 | A farmer has 1500 tomato plants. He wants to apply 220 ml of liquid fertilizer to each plant. The fertilizer is sold in containers each holding 50 litres and costing \$ 235. | | |
| | Calculate the total cost of the fertilizer that the farmer bought. | | |
| | [1 litre = 1000 mI] | | |
| | $1500 \times 220 = 330000$ ml | | |
| | = 330 l | | |
| | No of containers $=$ $\frac{330}{50} = 6.6$ | | |
| | $Total \ cost = 7 \times 235 = \1645 | | |
| | Answer \$1645[2] | | |

Given that $8 \times 16^{-a} = 1$, find the value of *a*. 5 (a) $2^3 \times 2^{-4a} = 2^0$ 3 - 4a = 0 $a = \frac{3}{4}$ Answer (**a**) $a = \frac{3}{4}$[2] Mercury is the fastest planet with an orbital speed of 1.72×10^5 km/h. **(b)** Neptune is the slowest planet with an orbital speed of 1.95×10^4 km/h. Given that the orbital speed of Mercury is k times of the orbital speed of Neptune, find the value of k. Give your answer to a sensible degree of accuracy. $\frac{1.72 \times 10^5}{1.95 \times 10^4} = 8.82 \text{ or } 8.8 \text{ or } 9$ $\frac{2}{(t-2)^2} - \frac{3}{(4-2t)}$ 6 Express as a single fraction in its simplest form $\frac{2}{(t-2)^2} - \frac{3}{(4-2t)}$ $=\frac{2}{(t-2)^2}+\frac{3}{2(t-2)}$ $=\frac{4+3(t-2)}{2(t-2)^2}$ $=\frac{3t-2}{2(t-2)^2}$ $=\frac{3t-2}{2(t-2)^2}$ *Answer*.....[3]

| 7 | The mean weight of five rocks on Earth was 3.462 N. The standard deviation of the weights |
|---|---|
| | of the five rocks was 0.0683 N. |
| | The five rocks were then weighed on the Moon. The weights of the five rocks on the |
| | moon were 16.5% of their weights on Earth. |
| | For the weights of the five rocks on the Moon, find |
| | (a) the mean, |
| | (b) the standard deviation of the weights. |
| | |
| | (a) Mean weight = $3.462 \times \frac{16.5}{100} = 0.571$ (3sf) |
| | 47 - |
| | (b) Standard Deviation = $0.0683 \times \frac{16.5}{100} = 0.0113$ (3sf) |
| | Answer $(\mathbf{a}) = 0.571$ N[1] |
| | (b) 0.0113N[1] |
| 8 | The initial population of biological organisms is 600. |
| | The population after t days is given by the formula |
| | $P = (00 \times 2.2)^{t}$ |
| | $P = 600 \times 3.21$. |
| | (i) Coloulate D when $t = 2$ |
| | (1) Calculate P when $t = 5$. |
| | Give your answer correct to the hearest whole number. |
| | $P = (00 - 2.21^3 + 100.45)$ |
| | $P = 600 \times 3.21^{\circ} = 19845.6$ |
| | Nearest whole number = 19846 |
| | |
| | Answer (i)19846[1] |
| | (ii) Find the percentage increase in the population over the first 2 days |
| | (ii) Find the percentage increase in the population over the first 5 days. 10845.6 - 600 |
| | $\frac{19840-000}{100} \times 100\%$ or $\frac{19840-000}{100} \times 100\%$ |
| | 600 600 |
| | |
| | = 3207.6% = 3210% (3sf) $= 3207.6% = 3210%$ (3sf) |
| | |
| | |
| | Anguag (#) 2210 0/ [2] |
| | Answer (II) |
| 1 | |



11Roger can assemble 7 toy cars in 5 hours.
Paul can assemble 8 toy cars in 6 hours.
Roger and Paul work together to assemble a total of 20 toy cars.
If they continue to assemble at the same rate, how long will it take them to assemble the 20
toy cars? Give your answer in hours and minutes, to the nearest minutes.In 1 h Roger will assemble $\frac{7}{5}$ toys
In 1 h Paul will assemble $\frac{8}{6}$ toys
Time taken for both to assemble 20 toys = $\frac{20}{\left(\frac{7}{5} + \frac{8}{6}\right)} = 7\frac{13}{41}$ h = 7h 19 minsAnswer ...7h 19 mins

12 Sally is drawing a quadrilateral ABCD such that AB is parallel to DC. The angles, in degrees, of the quadrilateral are angle DAB = 10x + 70, angle ABC = 61 - 3x, angle BCD= 56 + 12x and angle ADC = 6x - 2. (a) Calculate the value of *x*. (a) 10x + 70 + 6x - 2 = 180 (int. $\angle s$, AB parallel DC) x = 7**(b)** What is the special name of the quadrilateral? Justify your answer. The quadrilateral is a parallelogram (opposite angles are equal) $\angle DAB = \angle BCD = 140^{\circ}$ $\angle ADC = \angle ABC = 40^{\circ}$ $\angle DAB + \angle ABC = 180^{\circ}$ (sum of interior angles in parallel line) Or AD // BC 13 The diagram shows a heptagon and a triangle. (a) Find the sum of the interior angles of the heptagon. $(7-2) \times 180^{\circ} = 900^{\circ}$ (b) Calculate the sum of the angles a, b, c, d, e, f, g, h, i and j in this diagram. $7 \times 360^{\circ} - (a+b+g+h+i+j+c+f+d+e-540^{\circ}) = 900^{\circ}$ $a+b+c+d+e+f+g+h+i+j=2160^{\circ}$

14 (a) Express 4536 as the product of its prime factors.

$$4536 = 2^{3} \times 3^{4} \times 7$$

$$Answer (a) \qquad 2^{3} \times 3^{4} \times 7 \dots [1]$$
(b) Given that $\frac{4536}{k} = p^{3}$, where k and p are integers and p is as large as possible.
Find the value of k.

$$4536 = 2^{2} \times 3^{4} \times 7 = kp^{3}$$

$$4536 = 7 \times 3 \times 2^{2} \times 3^{3} = 21 \times (2 \times 3)^{3}$$

$$k = 21$$

$$Answer (b) \dots k = 21 \dots [1]$$
(c) The lowest common multiple of two numbers is 4536. The highest common factor of these two numbers is 189. Given that both numbers are between 189 and 4536, find the two numbers.

$$LCM = 2^{3} \times 3^{4} \times 7$$

$$HCF = 3^{3} \times 7$$
The two numbers = $2^{3} \times 3^{3} \times 7 = 1512$

$$3^{4} \times 7 = 567$$

$$Answer (c) \dots 1512 \dots, \dots, 567 \dots [2]$$



(b) Find the shortest distance from X to YZ produced. $sin X\hat{Z}Y = \frac{XY}{23}$ $XY = 23sin 77.4441^{\circ}$ = 22.4 cm (3 sf)Answer (b).......22.4...... cm [2]



| 18 | The table shows the discounts given to members of a dance studio. The membership fee is |
|----|--|
| | \$30. |
| | Class Members' discount |
| | Chacha 20% |
| | Tango 10% |
| | Tango 1070 |
| | Kelly is interested to sign up for the Samba class which costs \$350.(a) Calculate how much she saves if she becomes a member and then signs up for the Samba class. |
| | $350 - (30 + 0.85 \times 350) = 22.50$ |
| | Answer (a) \$22.50 |
| | After she has joined as a member and signed up for the Samba class, she was offered a further 12% discount on the members' price for the Chacha and Tango classes. (b) Write down a formula for <i>P</i>, the total amount, in dollars, that she needs for her Chacha and Tango classes. Use <i>U</i> and <i>V</i> to represent the original price, in \$, for the Chacha and Tango classes respectively. |
| | P = 0.88(0.8U + 0.9V) for $0.8U$ or $0.9V$ or 0.88 |
| | or $= 0.704U + 0.792V$ |
| | or $= \frac{88}{125}U + \frac{99}{125}V = \frac{11}{125}(8U + 9V)$ |
| | |
| | |
| | Answer (b) $P = 0.88(0.8U + 0.9V)$ [2] |
| | = 0.704U + 0.792V |
| | $\frac{88}{125}U + \frac{99}{125}V = \frac{11}{125}(8U + 9V)$ |

[Turn over

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