

MATHEMATICAL STUDIES SL

ALGEBRA PRACTICE

1. The speed of sound in air is given as 300 ms^{-1} .
- (a) How many metres does sound travel in air in one hour?
- (b) Express your answer to part (a)
- (i) correct to **two** significant figures;
- (ii) in the form $a \times 10^k$, where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

Working:

Answers:

(a).....

(b) (i)

(ii)

(Total 4 marks)

2. (a) Calculate $\frac{77.2 \times 3^3}{3.60 \times 2^2}$. (1)

- (b) Express your answer to part (a) in the form $a \times 10^k$, where $1 \leq a < 10$ and $k \in \mathbb{Z}$. (2)

- (c) Juan estimates the length of a carpet to be 12 metres and the width to be 8 metres. He then estimates the area of the carpet.
- (i) Write down his estimated area of the carpet. (1)

When the carpet is accurately measured it is found to have an area of 90 square metres.

- (ii) Calculate the percentage error made by Juan. (2)

Working:

Answers:

(a)

(b)

(c) (i).....

(ii).....

(Total 6 marks)

3. If $x = 3.1 \times 10^4$ and $y = 2.4 \times 10^{-7}$, calculate the values of the following, expressing your answers in the form $a \times 10^k$, where $1 \leq a < 10$ and $k \in \mathbb{Z}$

(a) x^2

(b) $\frac{x}{y}$

Working:

Answers:

(a)

(b)

(Total 4 marks)

4. Using the formula $V = r^2 (H - h)$, and your calculator value of r , calculate the value of V when $r = 4.26$, $H = 21.58$ and $h = 14.35$.

- (a) Give the full calculator display.
- (b) Give your answer to two decimal places.
- (c) Give your answer to two significant figures.
- (d) Write your answer to part (c) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

Working:

Answers:

(a)

(b)

(c)

(d)

(Total 8 marks)

5. Arthur needs to calculate a value from a trigonometric formula. He uses his calculator to find the value of r given by $r = \frac{1}{\sin(86^\circ) - \sin(85^\circ)}$.

- (a) Calculate the value of r , correct to three significant figures.
- (b) Arthur makes the mistake of rounding both of the sines to three significant figures **before** taking their difference. Calculate the value of r found by Arthur. Call this value r_A .
- (c) Calculate the percentage error E in Arthur's calculation, given by the formula

$$E = \frac{100(r - r_A)}{r}.$$

Working:

Answers:

(a)

(b)

(c).....

(Total 8 marks)

6. Jacques can buy six CDs and three video cassettes for \$163.17 or he can buy nine CDs and two video cassettes for \$200.53.

(a) Express the above information using two equations relating the price of CDs and the price of video cassettes.

(b) Find the price of one video cassette.

(c) If Jacques has \$180 to spend, find the exact amount of change he will receive if he buys nine CDs.

Working:

Answers:

(a)

(b)

(c)

(Total 6 marks)

7. Mal is shopping for a school trip. He buys 50 tins of beans and 20 packets of cereal. The total cost is 260 Australian dollars (AUD).

(a) Write down an equation showing this information, taking b to be the cost of one tin of beans and c to be the cost of one packet of cereal in AUD.

(1)

Stephen thinks that Mal has not bought enough so he buys 12 more tins of beans and 6 more packets of cereal. He pays 66 AUD.

(b) Write down another equation to represent this information.

(1)

(c) Find the cost of one tin of beans.

(2)

(d) (i) Sketch the graphs of these two equations.

(ii) Write down the coordinates of the point of intersection of the two graphs.

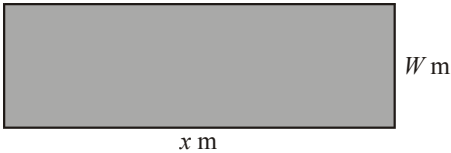
(4)

Working:

<p>Sketch for (d)(i)</p> <div style="border: 1px solid black; height: 150px; margin-top: 10px;"></div>	<p><i>Answers:</i></p> <p>(a)</p> <p>(b)</p> <p>(c).....</p> <p>(d)(ii).....</p>
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(Total 8 marks)

8. The perimeter of this rectangular field is 220 m. One side is x m as shown.



- (a) Express the width (W) in terms of x .
- (b) Write an expression, in terms of x only, for the area of the field.
- (c) If the length (x) is 70 m, find the area.

Working:

Answers:

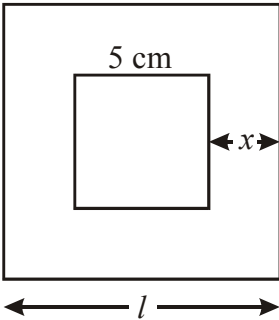
(a)

(b)

(c).....

(Total 4 marks)

- 9. A picture is in the shape of a square of side 5 cm. It is surrounded by a wooden frame of width x cm, as shown in the diagram below.



- The length of the wooden frame is l cm, and the area of the wooden frame is A cm².
- (a) Write an expression for the length l in terms of x . (1)
 - (b) Write an expression for the area A in terms of x . (2)
 - (c) If the area of the frame is 24 cm², find the value of x . (4)

Working:

Answers:

(a)

(b)

(c).....

(Total 7 marks)

10. (a) Factorize the expression $2x^2 - 3x - 5$.

(b) Hence, or otherwise, solve the equation $2x^2 - 3x = 5$.

Working:

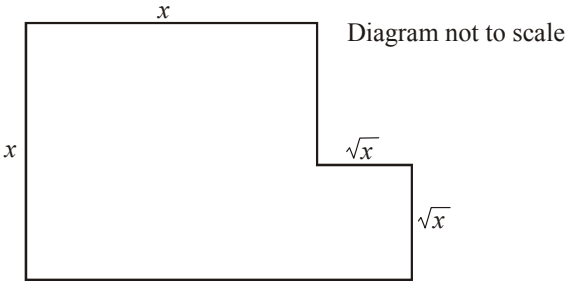
Answers:

(a)

(b)

(Total 4 marks)

11. A swimming pool is to be built in the shape of a letter L. The shape is formed from two squares with side dimensions x and \sqrt{x} as shown.



- (a) Write down an expression for the area A of the swimming pool surface.
- (b) The area A is to be 30 m^2 . Write a quadratic equation that expresses this information.
- (c) Find both the solutions of your equation in part (b).
- (d) Which of the solutions in part (c) is the correct value of x for the pool? State briefly why you made this choice.

Working:

Answers:

(a)

(b)

(c)

(d)

.....

.....

.....

(Total 8 marks)

12. (a) Factorize the expression $x^2 - 25$.
- (b) Factorize the expression $x^2 - 3x - 4$.
- (c) Using your answer to part (b), or otherwise, solve the equation $x^2 - 3x - 4 = 0$.

Working:

Answers:

(a)
(b)
(c)

(Total 8 marks)

13. The length of one side of a rectangle is 2 cm longer than its width.
- (a) If the smaller side is x cm, find the perimeter of the rectangle in terms of x .
- The perimeter of a square is equal to the perimeter of the rectangle in part (a).
- (b) Determine the length of each side of the square in terms of x .
- The sum of the areas of the rectangle and the square is $2x^2 + 4x + 1$ (cm^2).
- (c) (i) Given that this sum is 49 cm^2 , find x .
- (ii) Find the area of the square.

Working:

Answers:

(a)
(b)
(c) (i).....
(ii).....

(Total 6 marks)