



Subject: Grade 9 Mathematics

Topic: Mathematics: Term 1 - Mini-Exam

Total: 98 Marks

1. $2 \mid x=2$

3 marks

Explanation:

$$4(x - 3) = -3(x - \frac{2}{3}) \quad \text{Distributive law}$$

$$4x - 12 = -3x + 2 \quad \text{Collect like terms}$$

$$4x + 3x = 2 + 12$$

$$7x = 14$$

$$\frac{7x}{7} = \frac{14}{7}$$

$$\therefore x = 2$$

2. $12a-17 \mid -17+12a$

3 marks

Explanation:

$$2(3a - 4) - 3(-2a + 3)$$

Distribute the 2 and the -3 into the brackets:

$$= 6a - 8 + 6a - 9$$

Collect like terms:

$$= 12a - 17$$

3. $18706,76 \mid R18706,76 \mid 18706.76 \mid R18706.76$

3 marks

Explanation:

The formula for compound interest:

$$A = P(1 + i)^n$$

A = the accumulated value after interest

P = the present/original value before interest

i = the interest rate as a percentage or a fraction over 100

n = the time period (as per the interest period)

$$\begin{aligned} A &= 12\,300(1 + \frac{15}{100})^3 \\ &= 18\,706,76 \end{aligned}$$



4. B: $\frac{3p^{10}}{-8q^{10}}$

4 marks

Explanation:

$$(-2p^{-3}q^2)^{-3} \times 3pq^{-4}$$

Apply the law $(ab)^n = a^n b^n$:

$$= (-2)^{-3} \cdot p^{(-3)(-3)} \cdot q^{(2)(-3)} \times 3pq^{-4}$$

$$= \frac{1}{(-2)^3} \cdot p^9 \cdot q^{-6} \times 3pq^{-4}$$

Apply the law: $a^m \times a^n = a^{m+n}$

$$= \frac{3}{-8} p^{9+1} q^{-6-4}$$

$$= \frac{3}{-8} p^{10} q^{-10}$$

Apply the deduction with negative exponents:

$$= \frac{p^{10}}{-8q^{10}}$$

5. 0 | -2

4 marks

Explanation:

The input of -1 has an output of 0.

The output of -1 has an input of -2.

6. A: 4 000

4 marks

Explanation:

20 000 litres in $2\frac{1}{2}$ hours.

$$\begin{aligned}\text{rate} &= \frac{\text{litres}}{\text{hour}} \\ &= \frac{20\,000}{2,5} \\ &= 8\,000 \text{ litres/hour}\end{aligned}$$

This means 8 000 litres in 1 hour.

30 minutes is half an hour.

Therefore there will be 4 000 litres in 30 minutes.

7. false

2 marks

Explanation:

$$\frac{-2x^{-3}y}{4x^{-4}}$$

Simplify the numbers first: $(\frac{-2}{4} = -\frac{1}{2})$

$$= -\frac{x^{-3}y}{2x^{-4}}$$

Apply the law for division to exponents: $(\frac{a^m}{a^n} = a^{m-n})$

$$= -\frac{x^{-3-(-4)}y}{2}$$

Simplify:

$$= -\frac{xy}{2}$$

Explanation:

Add all the fruit juices together to determine the volume of this.

Note: 1 cup is 250 ml.

$$\begin{aligned}1\frac{1}{3} + \frac{2}{3} + \frac{1}{4} &= \frac{4}{3} + \frac{2}{3} + \frac{1}{4} \quad \text{LCD: 12} \\&= \frac{16}{12} + \frac{8}{12} + \frac{3}{12} \\&= \frac{27}{12} \\&= 2\frac{1}{4} \text{ cups of fruit juice}\end{aligned}$$

1 litre is 4 cups

To determine the amount of lemonade:

$$\begin{aligned}4 - 2\frac{1}{4} &= 4 - \frac{9}{4} \\&= \frac{16}{4} - \frac{9}{4} \\&= \frac{7}{4}\end{aligned}$$

This is $1\frac{3}{4}$ cups of lemonade.

To determine the percentage of lemonade in the 1 litre (4 cups) of fruit punch:

$$\begin{aligned}1\frac{3}{4} \div 4 \times 100 &= \frac{7}{4} \times \frac{1}{4} \times 100 \\&= \frac{7}{16} \times 100 \\&= 43,75\%\end{aligned}$$

9. D: $\frac{x+6}{12x}$

4 marks

Explanation:

$$\begin{aligned}\frac{x+3}{2x} - \frac{x+4}{4x} - \frac{1}{3} &= \frac{6(x+3)}{12x} - \frac{3(x+4)}{12x} - \frac{4x}{12x} \quad \text{LCD: } 12x \\ &= \frac{6x+18}{12x} - \frac{(3x+12)}{12x} - \frac{4x}{12x} \quad \text{Simplify} \\ &= \frac{8x+18-3x-12-4x}{12x} \\ &= \frac{x+6}{12x}\end{aligned}$$

10. -1 | -6 | -1

6 marks

Explanation:

$$\frac{18p^3q^A}{Bp^4q^2} = \frac{-3p^C}{q^3}$$

$$\frac{q^A}{q^2} = \frac{1}{q^3}$$

$$\frac{q^{-1}}{q^2} = \frac{1}{q^3}$$

A is -1.

Working with the numbers:

$$\frac{18}{B} = -3 \quad \therefore B = -6$$

$$\frac{p^3}{p^4} = p^C$$

$$p^{3-4} = p^C$$

The value of C is -1.

11. $0,7a \mid 0,12a \mid 0,027a^3$

8 marks

$\mid 9a$

Explanation:

a) $0,3a + 0,4a = 0,7a$

$$\frac{3}{10}a + \frac{4}{10}a = \frac{7}{10}a$$

b) $0,3a \times 0,4 = 0,12a$

$$\frac{3}{10}a \times \frac{4}{10} = \frac{12}{100}a$$

c) $(0,3a)^3 = 0,027a^3$

$$\left(\frac{3}{10}a\right)^3 = \frac{27}{1000}a^3$$

d) $0,27a \div 0,03 = 9a$

$$\frac{27}{100}a \times \frac{100}{3} = 9a$$

12. false

2 marks

Explanation:

If $x = -2$, then the value of $2x^2 - 3x + 1$ is:

$$2(-2)^2 - 3(-2) + 1 = 2(4) + 6 + 1$$

$$= 8 + 6 + 1$$

$$= 15$$

13. C: $4,322 \times 10$

4 marks

Explanation:

$$432,2 \times 10^{-4} \times 10^3 \quad \text{Apply the law of multiplication}$$

$$= 432,2 \times 10^{-1}$$

$$= 43,22 \quad \text{Express in scientific notation}$$

$$= 4,322 \times 10$$

14. C: R250

4 marks

Explanation:

This is inverse proportion. As the number of winners increases, the prize money per person decreases.

$$1 \text{ winner: } 4\,000 \times 1 = 4\,000$$

$$2 \text{ winners: } 2\,000 \times 2 = 4\,000$$

$$\therefore xy = k$$

The constant k is 4 000.

$$x \times 16 = 4\,000$$

$$x = \frac{4\,000}{16}$$

$$x = 250$$

Each winner will get R250.

15. false

2 marks

Explanation:

The output (y) values are -6 ; -13 ; $-20 \dots$

This is a constant difference of -7 . The constant difference is what the input (x) must be multiplied by.

$$y = -7x + c$$

To determine c , substitute an x and y -value in:

$$-6 = -7(1) + c$$

$$-6 = -7 + c$$

$$c = 1$$

The rule is $y = -7x + 1$.

Test the rule by substituting $x = 1 ; 2 ; 3 ; \dots$ to see that the outputs are correct.

16. $-24 \mid x = -24$

3 marks

Explanation:

$$\frac{x}{3} - \frac{x}{2} = 4$$

The LCD is 6.

$$\frac{2x}{6} - \frac{3x}{6} = \frac{24}{6}$$

Multiply by 6.

$$2x - 3x = 24$$

$$-x = 24$$

$$\therefore x = -24$$

17. B: $\frac{27}{8}x^3$

4 marks

Explanation:

Collect like terms, and then $(x + \frac{1}{2}x)^3 = (\frac{3}{2}x)^3$

$$= \frac{27}{8}x^3$$

18. false

2 marks

Explanation:

$$\begin{aligned} & 3(-2x)(-4x) - (-5x^2)(-6) \\ &= 24x^2 - (+30x^2) \\ &= 24x^2 - 30x^2 \\ &= -6x^2 \end{aligned}$$

Multiply first
Simplify
Collect like terms

Explanation:

1. $\frac{-16}{4} = -4$

Rational and integer.

2. $\sqrt{25} = 5$

Rational, integer and whole.

3. $-\frac{3}{2}$

Rational

4. $\frac{\pi}{2}$

(π) is irrational, therefore the whole fraction becomes irrational.

20. D: $-8x^2 + 24x - 18$

Explanation:

$-2(2x - 3)^2$ Write bracket out twice

$= -2(2x - 3)(2x - 3)$ FOIL the brackets

$= -2(4x^2 - 6x - 6x + 9)$ Collect like terms

$= -2(4x^2 - 12x + 9)$ Distribute -2 into bracket

$= -8x^2 + 24x - 18$

21. 2 500 | 22 500 | 10 800 | 693,75

8 marks

Explanation:

Daniel takes out a hire purchase loan for R25 000. A deposit of 10% is required. The loan is repaid over 4 years. The interest rate on the loan is 12% per annum.

$$10\% \text{ of R25 000} = \frac{10}{100} \times 25\,000 \\ = 2\,500$$

The deposit is R2 500.

Cash price — deposit = balance

$$25\,000 - 2\,500 = 22\,500$$

The balance of the loan is R22 500.

Hire purchase uses simple interest:

$$SI = p \times i \times n \\ = 22\,500 \times \frac{12}{100} \times 4 \\ = 10\,800$$

The interest charged on the loan is R10 800.

The total value of the loan is:

$$22\,500 + 10\,800 = 33\,300$$

This is divided into equal payments over 4 years (48 months).

$$33\,300 \div 48 = 693,75$$

The monthly repayment is R693,75.

22. 27 | 62 | 10

6 marks

Explanation:

Dots are used to form the letter "H".

The number of dots can be written as a number pattern:

7 ; 12 ; 17 ; 22 ; ...

There is difference of 5 dots between each "H".

There will be 27 dots in the 5th letter "H".

There will be 62 dots in the 12th letter "H".

There is a general formula where T_n is the number of dots and n is the position of the "H".

$$T_n = 5n + 2$$

Which "H" will have 52 dots?

$$52 = 5n + 2$$

$$50 = 5n$$

$$n = 10$$

The 10th "H" will have 52 dots.

23. true

2 marks

Explanation:

The first number is x .

The next consecutive number is $x + 1$.

The following consecutive number is $x + 1 + 1$.

$$\therefore x + (x + 1) + (x + 1 + 1) = 3x + 3$$

24. 21; 34 ; 55 | 21, 34, 55

3 marks

Explanation:

3 ; 5 ; 8 ; 13 ; ...

$$3 + 5 = 8$$

$$8 + 5 = 13$$

$$\therefore 13 + 8 = 21$$

$$21 + 13 = 34$$

$$34 + 21 = 55$$

3 ; 5 ; 8 ; 13 ; 21 ; 34 ; 55 ; ...

25. -6y

3 marks

Explanation:

$$-2y - 8y - (-4y)$$

Simplify

$$= -2y - 8y + 4y$$

Simplify integer coefficients

$$= -6y$$

Total: 98 Marks