



Subject: Grade 9 Mathematics

Topic: Mathematics: Term 2 - Exam 1

Total: 89 Marks

1. true

2 marks

Explanation:

Substitute $n = 1, n = 2, n = 3$, etc. into $2n$ to see if it gives the pattern:

$$n = 1: 2n = 2(1) = 2$$

$$n = 2: 2n = 2(2) = 4$$

$$n = 3: 2n = 2(3) = 6$$

$$n = 4: 2n = 2(4) = 8$$

Therefore, $2n$ is the rule which describes the given number pattern.

2. false

2 marks

Explanation:

If the sum of two numbers is zero, they are additive inverses to each other.

If the product of two numbers is -1, they are multiplicative inverses.

So these terms are not additive inverses.

The additive inverse of $5x^2$ would be $-5x^2$.

3. A: -1

4 marks

Explanation:

Multiply throughout by the lowest common multiple (LCM) of the denominators to eliminate the fraction.

The LCM of 3 and 2 is 6.

Then:

$$\frac{2(x+1)}{3} - \frac{(x-1)}{2} = 1$$

$$\therefore \frac{2x+2}{3} - \frac{x-1}{2} = 1$$

$$\therefore 2(2x+2) - 3(x-1) = 6 \times 1 \quad [\times 6]$$

$$\therefore 4x + 4 - 3x + 3 = 6$$

$$\therefore x + 7 = 6$$

$$\therefore x = -1$$



4. D: $(x - 3)(3x - 2)$

4 marks

Explanation:

$$\begin{aligned} & 3x(x - 3) + 2(3 - x) \\ &= 3x(x - 3) - 2(x - 3) \text{ [Switch-around]} \\ &= (x - 3)(3x - 2) \text{ [(} x - 3 \text{) taken out as common factor]} \end{aligned}$$

5. true

2 marks

Explanation:

First multiply the brackets with each other.

$$\begin{aligned} & 3b^3 - b(b - 3)(3b - 2) \\ &= 3b^3 - b(3b^2 - 9b - 2b + 6) \text{ [Brackets multiplied using FOIL method]} \\ &= 3b^3 - b(3b^2 - 11b + 6) \text{ [Like terms added]} \\ &= 3b^3 - b(3b^2) - b(-11b) - b(+6) \text{ [Bracket's terms multiplied by } -b\text{]} \\ &= 3b^3 - 3b^3 + 11b^2 - 6b \text{ [Brackets removed; Note the signs!]} \\ &= 11b^2 - 6b \text{ [Like terms added]} \end{aligned}$$

It is not wrong to multiply b into the first bracket first and then to multiply that answer with the second bracket, but it is more complicated.

6. $b + x \mid x + b$

3 marks

Explanation:

$$\begin{aligned} & \frac{(b+x)^3}{(b+x)^2} \\ &= \frac{(b+x)(b+x)(b+x)}{(b+x)(b+x)} \text{ [Brackets expanded]} \\ &= \frac{(b+x) (b+x) (b+x)}{(b+x) (b+x)} \\ &= \frac{(b+x)}{1} \text{ [Equal factors cancelled]} \\ &= b + x \end{aligned}$$

7. 0; 2; 6

4 marks

Explanation:

$$Tn = n^2 - n$$

$$T1 = (1)^2 - 1 = 1 - 1 = 0$$

$$T2 = (2)^2 - 2 = 4 - 2 = 2$$

$$T3 = (3)^2 - 3 = 9 - 3 = 6$$

8. B: $6x^2 + 2xy$

4 marks

Explanation:

$$\begin{aligned} & 4x(x + 2y) + 5(x^2 - 2xy) - (3x^2 - 4xy) \\ &= 4x^2 + 8xy + 5x^2 - 10xy - 3x^2 + 4xy \text{ [Brackets removed]} \\ &= 4x^2 + 5x^2 - 3x^2 + 8xy - 10xy + 4xy \text{ [Like terms grouped]} \\ &= 6x^2 + 2xy \text{ [Like terms added]} \end{aligned}$$

9. $9y$

3 marks

Explanation:

$$\begin{aligned} & \frac{y}{4} + \frac{5y}{3} - \frac{7y}{6} \\ &= \frac{(y \times 3) + (5y \times 4) - (7y \times 2)}{12} \\ &= \frac{3y + 20y - 14y}{12} \\ &= \frac{9y}{12} \end{aligned}$$

This fraction can be simplified:

$$\frac{9y}{12} = \frac{3y}{4}$$

10. $29p$

3 marks

Explanation:

$$\begin{aligned} & \frac{3p}{2} + \frac{7p}{5} \\ &= \left(\frac{3p}{2} \times \frac{5}{5} \right) + \left(\frac{7p}{5} \times \frac{2}{2} \right) \\ &= \frac{(3p \times 5) + (7p \times 2)}{10} \\ &= \frac{15p + 14p}{10} \\ &= \frac{29p}{10} \end{aligned}$$

11. $-1 \mid 3 \mid \frac{1}{2}$

6 marks

Explanation:

1. The constant term is -1 , as it has no variable.

The sign is part of the value.

2. The degree of the expression is 3 , as it is the highest power of x .

3. The coefficient of x is $\frac{1}{2}$, as it is the value by which x is multiplied.

The question did not ask the coefficient of x^2 or x^3 .

12. $8 \mid$ eight

3 marks

Explanation:

$$\begin{aligned} & p^5 \cdot p^2 \cdot p \\ &= p^5 \cdot p^2 \cdot p^1 \text{ [No exponent given: 1 is implied]} \\ &= p^{5+2+1} \text{ [Equal bases multiplied: exponents added]} \\ &= p^8 \end{aligned}$$

Therefore, the exponent of p in the simplified answer is 8 .

13. 11

3 marks

Explanation:

Questions answered correctly: x

Questions answered incorrectly: $20 - x$

5 points per x correct questions: $5x$

3 points per $(20 - x)$ incorrect questions: $3(20 - x)$

Then:

$$\begin{aligned} 5x - 3(20 - x) &= 28 \\ \therefore 5x - 60 + 3x &= 28 \\ \therefore 8x - 60 &= 28 \\ \therefore 8x &= 28 + 60 \\ \therefore 8x &= 88 \\ \therefore x &= 11 \end{aligned}$$

Therefore, they answered 11 questions correctly.

14. -2

3 marks

Explanation:

$$7x - 8 = 4x - 14$$

$$\therefore 7x - 4x - 8 = 4x - 4x - 14 \text{ [Subtract } 4x \text{ from both sides]}$$

$$\therefore 3x - 8 = -14$$

$$\therefore 3x - 8 + 8 = -14 + 8 \text{ [Add 8 to both sides]}$$

$$\therefore 3x = -6$$

$$\therefore x = -2 \text{ [Divide both sides by 3]}$$

15. A: $(a + b)(3 + x)(3 - x)$

4 marks

Explanation:

$$9(a + b) - x^2(a + b)$$

$$= (a + b)(9 - x^2) \text{ [(} a + b \text{) taken out as common factor]}$$

$$= (a + b)(3 + x)(3 - x) \text{ [Difference between squares]}$$

16. true

2 marks

Explanation:

$$18m^2 - 24m^3$$

$$= 6m^2(3) - 6m^2(4m) \text{ [Common factor: } 6m^2 \text{]}$$

$$= 6m^2(3 - 4m) \text{ [Common factor taken out]}$$

17. 1 | 0 | 0

6 marks

Explanation:

$$6x = 6$$

1. $\therefore x = 1$ [Both sides divided by 6]

$$6x = 0$$

2. $\therefore x = 0$ [Both sides divided by 6]

Remember:

$0 \div 6 = 0$ but $6 \div 0$ is undefined.

$$6x = x$$

$$\therefore 6x - x = x - x$$

3. $\therefore 5x = 0$

$$\therefore x = 0 \text{ [Both sides divided by 5]}$$

18. false

2 marks

Explanation:

$$\begin{aligned}(p^5)^3 &= p^5 \cdot p^5 \cdot p^5 \\ &= (p \cdot p \cdot p \cdot p \cdot p)(p \cdot p \cdot p \cdot p \cdot p)(p \cdot p \cdot p \cdot p \cdot p) \\ &= p^{15}\end{aligned}$$

Using the following rule is much quicker:

$$(m^x)^y = m^{x \times y}$$

Therefore, you must multiply the exponents:

$$(p^5)^3$$

$$= p^{5 \times 3}$$

$$= p^{15}$$

This answer is equal to $p^{5 \times 3}$ and not to p^{5+3} .

19. D: 0

4 marks

Explanation:

$$\begin{aligned}2(x-1)(3x+1) &= (3x+2)(2x-1) \\ \therefore 2(3x^2-2x-1) &= 6x^2+x-2 \\ \therefore 6x^2-4x-2 &= 6x^2+x-2\end{aligned}$$

As the terms containing x^2 will cancel, the terms containing x can be written on the left-hand side and the constant terms can be written on the right-hand side of the equation.

Then:

$$\begin{aligned}-4x - x &= -2 + 2 \\ \therefore -5x &= 0 \\ \therefore x &= -\frac{0}{5} \\ \therefore x &= 0\end{aligned}$$

20. A: x^8

4 marks

Explanation:

$$\begin{aligned} & x^5 \div x^{-3} \\ &= x^5 \div \frac{1}{x^3} [a^{-n} = \frac{1}{a^n}] \\ &= x^5 \times \frac{x^3}{1} [\text{Multiplied by reciprocal}] \\ &= x^5 \times x^3 \\ &= x^{5+3} [\text{Equal bases multiplied: exponents added}] \\ &= x^8 \end{aligned}$$

21. true

2 marks

Explanation:

Substitute $x = -7$ into the equation to see if the left-hand side will be equal to the right-hand side.

LHS:

$$\begin{aligned} 5(-7) + 4 &= -35 + 4 \\ &= -31 \end{aligned}$$

RHS:

$$\begin{aligned} 3(-7) - 10 &= -21 - 10 \\ &= -31 \end{aligned}$$

The left-hand side is equal to the right-hand side, therefore $x = -7$ does make the equation true.

22. $10 \mid 2a \mid 3$

6 marks

Explanation:

$$\begin{aligned} & \frac{3a}{5} - \frac{2a-1}{2} + \frac{1}{10} \\ &= \frac{2(3a) - 5(2a-1) + 1}{10} \text{ [(Ans. 1)]} \\ &= \frac{6a - 10a + 5 + 1}{10} \\ &= \frac{-4a + 6}{10} \\ &= \frac{2(-2a + 3)}{10} \\ &= \frac{-2a + 3}{5} \text{ [(Ans. 2) and (Ans. 3)]} \end{aligned}$$

In the final steps, the numerator was factorised by taking 2 out as common factor.

Then that 2 was divided into the bottom to leave 5 as denominator.

23. -8 | minus eight | negative eight | minus 8 | negative 8

3 marks

Explanation:

It is given that $x = 8$.

Substitute this value of x into $14 = \frac{3}{4}x - y$:

$$\begin{aligned}14 &= \frac{3}{4}(8) - y \\ \therefore 14 &= 3(2) - y \\ \therefore 14 &= 6 - y \\ \therefore 8 &= -y \\ \therefore -8 &= y\end{aligned}$$

24. C: $-12x^3y + 3xy^2$

4 marks

Explanation:

$$\begin{aligned}\frac{60x^6y^3 - 15x^4y^4}{-5x^3y^2} &= \frac{60x^6y^3}{-5x^3y^2} + \frac{-15x^4y^4}{-5x^3y^2} \\ &= \frac{12x^3y^1}{-1} + \frac{3x^1y^2}{1} \\ &= -12x^3y + 3xy^2\end{aligned}$$

25. 100 cents | 50 cents

6 marks

Explanation:

Cost:

Lollipop = x

Chocolate bar = $2x$

Total Cost:

$$\begin{aligned}5(2x) + 8(x) &= 900 \\ \therefore 10x + 8x &= 900 \\ \therefore 18x &= 900 \\ \therefore x &= 50\end{aligned}$$

A lollipop costs 50c.

A chocolate bar will cost $2x = 100$ c.

