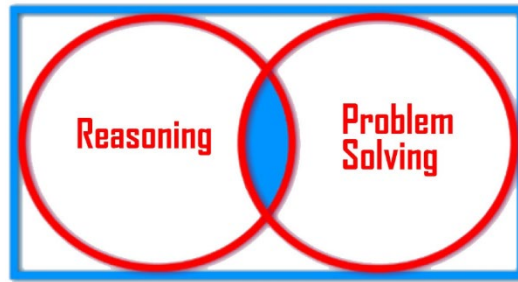


GCSE Foundation (5 – 1)



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Mathematical Reasoning Questions (Rearranging Formula and Identities) – Set 1 Solution

The questions are repeated here for your convenience

1 Johnny wants to make x the subject of the equation $y = 5x + 3$

Here is his answer:

Divide both sides by (5): $\frac{y}{5} = x + 3$

Subtract 3 from both sides : $\frac{y}{5} - 3 = x$

Therefore, $x = \frac{y}{5} - 3$

Johnny made a mistake. Identify this mistake and correct it

Solution

Johnny had to divide both y and 3 by 5 [1mark]

Correct method:

$y = 5x + 3$ {Divide both sides by 5}

$\frac{y}{5} = x + \frac{3}{5}$ {Subtract $\frac{3}{5}$ from each side}

$\frac{y}{5} - \frac{3}{5} = \frac{y-3}{5} = x$

So, $x = \frac{y-3}{5}$ [2marks]

2 Here is a formula: $z = yx + w$ Make x the subject of the formula

Natalie's Answer

$$z - w = yx$$

$$\frac{z - w}{y} = x$$

$$\text{Therefore } x = \frac{z - w}{y}$$

Jacob's Answer

$$\frac{z}{y} = x + \frac{w}{y}$$

$$\frac{z}{y} - \frac{w}{y} = x$$

$$\text{Therefore } x = \frac{z}{y} - \frac{w}{y}$$

Which of the statements below is correct

- a) Only Natalie is correct
- b) Only Jacob is correct
- c) Both answers are correct
- d) They are both wrong

Correct Answer: C [1mark]

3 Use one of the words below to describe each of the statements from a to d

Expression, Equation, Formula, Identity

a) $v = u + at$

b) $2(x + 5) - 6(10 - 7x) + 2$

c) $(2x + 1)(3x + 4) \equiv 6x^2 + 11x + 4$

d) $6x^2 = 42$

Solution

- a) Formula
- b) Expression
- c) Identity
- d) Equation

[4marks]

4 A formula connecting a , b and c is given as $3a = 6b + c$
When $a = 5$ and $c = -3$ the value of b will be?
Choose one answer

- a) 6
- b) -3
- c) 3
- d) -6

Solution

$$3(5) = 6b + (-3) \text{ \{Substituting } a = 5 \text{ and } c = -3\}}$$

$$15 = 6b - 3 \text{ \{add 3 to both sides\}}$$

$$18 = 6b \text{ \{divide both side by 6\}}$$

$$3 = b$$

Correct Answer: C

[2marks]

5 By expanding and simplifying the brackets in the identity below,
 $5(5 + 2x) + 3(6x - 7) \equiv Ax + B$
Show that the ratio of $A : B = 7 : 1$

Solution

$$5(5 + 2x) + 3(6x - 7) = 25 + 10x + 18x - 21$$

[1mark]

$$25 + 10x + 18x - 21 = 28x + 4$$

$$\text{Therefore, } 28x + 4 = Ax + B$$

[1mark]

$$\text{So, } A = 28, B = 4$$

$$\text{So, } A : B = 28 : 4 \text{ \{Simplify by dividing by 4\}}$$

$$\text{Therefore, } A : B = 7 : 1$$

[1mark]

6 Circle all the correct answers if c is made the subject of the formula $a(b + c) = d$

a) $c = \frac{d-ab}{a}$

b) $c = \frac{d+ab}{a}$

c) $c = \frac{d}{a} - b$

d) $c = \frac{d}{c} + b$

Solution

$a(b + c) = d$ {divide both sides by a }

$b + c = \frac{d}{a}$ {subtract b from each side}

$c = \frac{d}{a} - b$ {You may simplify further}

$c = \frac{d-ab}{a}$

Correct Answers: A and C

[3marks]

7 Make x the subject of the formula $2y^2 = x^2 + 5z$

Solution

$2y^2 = x^2 + 5z$ {Subtract $5z$ from both sides}

[1mark]

$2y^2 - 5z = x^2$ {square root both sides}

So, $x = \sqrt{2y^2 - 5z}$

[1mark]

8 Here is a relation

$$7b = 6c + \frac{2}{a}$$

Give a step by step instruction on how to make **a** the subject of the relation

Solution

$$7b = 6c + \frac{2}{a} \text{ {Subtract } 6c \text{ from both sides}} \quad \textbf{[1mark]}$$

$$7b - 6c = \frac{2}{a} \text{ {Multiply both sides by } a} \quad \textbf{[1mark]}$$

$$a(7b - 6c) = 2 \text{ {Now divide both sides by } (7b - 6c)} \quad \textbf{[1mark]}$$

$$\text{Therefore, } a = \frac{2}{7b-6c}$$

{Accept any set of similar steps leading to the right results}

9 Here is an identity.

$$6x(5x + 8) \equiv Px^2 + Qx$$

Find the values of P and Q

Solution

$$6x(5x + 8) \equiv Px^2 + Qx \text{ {Expand bracket}}$$

$$30x^2 + 48x \equiv Px^2 + Qx \quad \textbf{[1mark]}$$

By comparing the coefficients, we find that

$$\text{So, } P = 30 \text{ and } Q = 48 \quad \textbf{[2marks]}$$

- 10** The equation of a straight line is given as $Ax + By = C$
By making y the subject, find an expression for the gradient of the line.

Solution

$$Ax + By = C \text{ \{Subtract } Ax \text{ from each side\}}$$

$$By = -Ax + C \text{ \{Divide both sides by } B\} \quad \textbf{[1mark]}$$

$$y = -\frac{Ax}{B} + \frac{C}{B} \quad \textbf{[1mark]}$$

The gradient of a line is equal to the coefficient of x in the equation.

The coefficient of x is $-\frac{A}{B}$

Therefore, the gradient of the line will be $-\frac{A}{B}$. **[1mark]**