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Name : Answers

Date : / 11 / 2025

Subject: Worksheet (3) Unit (3)

Grade : 7 ()

Working With Powers

3.1 Simplifying expressions

Q1: Simplify

a. $4x + 7x = 11x$

b. $5m + 3n + 9m + n = 14m + 4n$

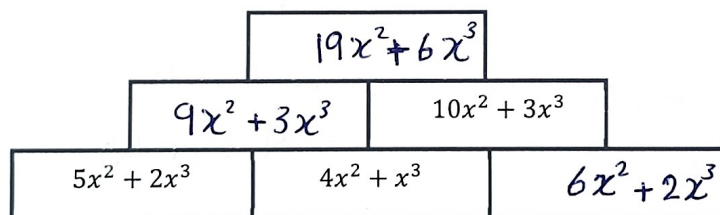
c. $6p + 4q - 2p - q = 4p + 3q$

d. $10x + 8y - 12x = -2x + 8y$

e. $2z^3 + 5z^2 - z^3 = 5z^2 + z^3$

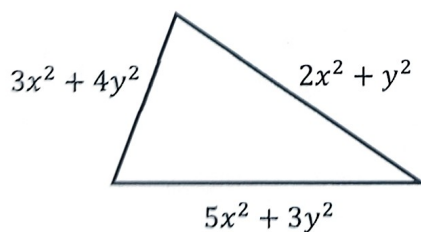
Q2: Complete this addition pyramid.

Each brick is the sum of the two bricks below it.



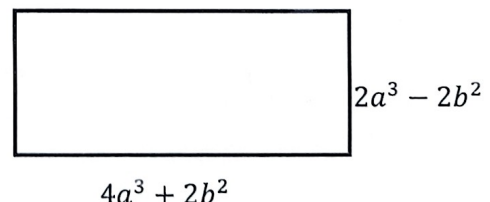
Q3: Write an expression for the perimeter of each shape. Write your answers in their simplest form.

a.



$10x^2 + 8y^2$

b.



$$\begin{aligned}
 & 2(4a^3 + 2b^2) + 2(2a^3 - 2b^2) \\
 & 8a^3 + \cancel{4b^2} + 4a^3 - \cancel{4b^2} \\
 & = 12a^3
 \end{aligned}$$

Q4: Expand and Simplify

$$\begin{aligned} \text{a. } & 4(y + 3) + 2(y - 5) \\ &= 4y + 12 + 2y - 10 \\ &= 6y + 2 \end{aligned}$$

$$\begin{aligned} \text{d. } & 6(n - 2) - 4(n + 3) \\ &= 6n - 12 - 4n - 12 \\ &= 2n - 24 \end{aligned}$$

$$\begin{aligned} \text{b. } & 5(a + 4) - 3(a - 1) \\ & 5a + 20 - 3a + 3 \\ & 2a + 23 \end{aligned}$$

$$\begin{aligned} \text{e. } & 3(p + 7) - (5p - 4) \\ & 3p + 21 - 5p + 4 \\ & -2p + 25 \end{aligned}$$

$$\begin{aligned} \text{c. } & 2(4b - 1) + 5(b - 2) \\ & 8b - 2 + 5b - 10 \\ & 13b - 12 \end{aligned}$$

$$\begin{aligned} \text{f. } & 5(2k - 3) - 2(3k - 4) \\ & 10k - 15 - 6k + 8 \end{aligned}$$

Q5: a. Write an expression for the area of the larger rectangle.

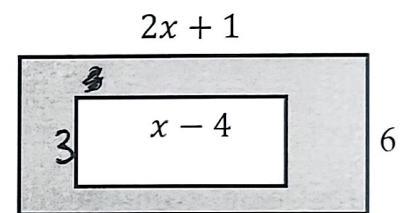
$$6(2x + 1) = 12x + 6$$

b. Write an expression for the area of the smaller rectangle.

$$3(x - 4) = 3x - 12$$

c. Write an expression for the shaded area.

$$\begin{aligned} (12x + 6) - (3x - 12) &= 12x + 6 - 3x + 12 \\ &= 9x + 18 \end{aligned}$$



3.2 More simplifying

Q1: Simplify.

$$\begin{aligned} \text{a. } & 3y \times 3y \\ &= 9y^2 \end{aligned}$$

$$\begin{aligned} \text{b. } & 6m \times 2n \\ &= 12mn \end{aligned}$$

$$\text{c. } \frac{10k}{5} = 2k$$

$$\text{d. } \frac{10x^6}{5x^2} = 2x^4$$

$$\text{e. } \frac{36m^{10}}{6m^3} = 6m^7$$

$$\text{f. } \frac{40k^5}{8k} = 5k^4$$

$$\text{g. } \frac{21y^8}{7y^5} = 3y^3$$

$$\text{h. } \frac{4r^2 \times 6r^2}{3r} = 8r^3$$

$$\text{i. } \frac{2a^4 \times 9a^2}{6a^3} = 3a^3$$

$$j. (3y^3)^2$$

$$= 3^2 y^{3 \times 2} = 9y^6$$

$$k. (5a^4)^3$$

$$= 5^3 a^{4 \times 3} = 125 a^{12}$$

$$l. (2k^2)^4 = 2^4 k^{2 \times 4}$$

$$= 16 k^8$$

$$m. \left(\frac{m^3}{5}\right)^2 = \frac{m^{3 \times 2}}{5^2} = \frac{m^6}{25}$$

$$n. \left(\frac{b^5}{3}\right)^3 = \frac{b^{5 \times 3}}{3^3} = \frac{b^{15}}{27}$$

$$o. \left(\frac{c^4}{6}\right)^2 = \frac{c^{4 \times 2}}{6^2} = \frac{c^8}{36}$$

3.3 Factorising expressions

Q1: Write the common factors of

a. 10 and 5m 1, 5

b. 14k and 7 1, 7

c. 18y and 12 1, 2, 3, 6

d. 9 and 15p 1, 3

Q2: Write the HCF of

a) 15m and 20 5

b) 42 and 18y 6

Q3: Factorise completely.

a. 5y + 15

$$5(y + 3)$$

b. 9k + 27

$$9(k + 3)$$

c. 10a + 30

$$10(a + 3)$$

d. 16x - 8

$$8(2x - 1)$$

e. 32 - 4b

$$4(8 - b)$$

f. 14 + 7t

$$7(2 + t)$$

g. 80m + 16

$$16(5m + 1)$$

h. 55 + 11p

$$11(5 + p)$$

i. 6x + 9y + 12

$$3(2x + 3y + 4)$$

j. 28 + 14a + 7b

$$7(4 + 2a + b)$$

k. rst + 5r + 15r

$$r(st + 5 + 15) \\ = r(st + 20)$$

l. 12ab + 8ac - 4a

$$4a(3b + 2c - 1)$$

Q4:

- a) Sara pays a £45 deposit for a new phone. She then pays £15 a month.

Write a formula for the total amount (T) paid after p months.

$$T = 15p + 45$$

- b) Ben pays a £300 deposit for a car. He then pays £150 a month.

Write a formula for the total amount paid after m months.

$$T = 150m + 300$$

- c) A health club charges a \$ 75 joining fee and \$ 35 per month.

Write a formula for the total cost (C) after n months.

$$C = 35n + 75$$

- d) A hiker is already 3 kilometers from the camp and walks at a steady pace of 5 kilometers per hour. Write a formula for the total distance (D) the hiker is from the camp after (h) hours.

$$D = 5h + 3$$

- e) A water tank holds 100 litres of water. Water is added to the tank at a rate of 12 Liters per minute. Write a formula for the total volume (V) of water in the tank after (t) minutes.

$$V = 12t + 100$$

3.4 Expanding and Factorising expressions

Q1: Simplify

a. $2x \times 2y = 4xy$

b. $4k \times 5k = 20k^2$

c. $3m \times -6m = -18m^2$

d. $5b^4 \times 3b^2$
 $= 15b^6$

e. $8q^3 \times -2q^4$
 $= -16q^7$

f. $-9x^2y \times 4xy^4$
 $= -36x^3y^5$

Q2: Expand

a. $3(4x + 2)$

$$12x + 6$$

b. $5(2 - 3y)$

$$10 - 15y$$

c. $x(x + 5)$

$$x^2 + 5x$$

d. $4(x - 2)$

$$4x - 8$$

e. $y(y^2 + 5y)$

$$y^3 + 5y^2$$

f. $3a(4a^4 - 2a^3)$

$$12a^5 - 6a^4$$

g. $4k(k^3 + 3k^2 + 6)$

$$4k^4 + 12k^3 + 24k$$

h. $b^3(b^2 - 4b + 5)$

$$b^5 - 4b^4 + 5b^3$$

Q3: Expand and simplify.

a. $3(x + 2y) + 4(x + y)$

$$= 3x + 6y + 4x + 4y$$

$$= 7x + 10y$$

b. $a(3a^2 + 4) + 2a(2a^2 + 6)$

$$3a^3 + 4a + 4a^3 + 12a$$

$$= 7a^3 + 16a$$

c. $2(5 - 3z) + z^2(z - 5)$

$$10 - 6z + z^3 - 5z^2$$

e. $4k(k + 3) - 3k^2(k^2 - 1)$

$$4k^2 + 12k - 3k^4 + 3k^2$$

$$= 7k^2 + 12k - 3k^4$$

d. $2y(y^2 + 3) - 6y^2(y^2 - 2y)$

$$2y^3 + 6y - 6y^4 + 12y^3 = 14y^3 + 6y - 6y^4$$

Q4: Write the highest common factor of each pair.

a. y^3 and y^5 y^3

b. k^4 and k k

c. a^6 and $2a^3$ a^3

d. $12b^5$ and $6b$ $6b$

e. $9n^4$ and $15n^2$ $3n^2$

f. x^2y^2 and x^3y^3 x^2y^2

Q5: Factorise completely.

a. $20y^4 - 4y = 4y(5y^3 - 1)$

b. $18a + 9a^3 = 9a(2 + a^2)$

c. $20x^4 - 35x^3 = 5x^3(4x - 7)$

d. $5t^4 + 10t = 5t(t^3 + 2)$

e. $d^3 - 9d^5 = d^3(1 - 9d^2)$

f. $5p^4 - 25p^2 = 5p^2(p^2 - 5)$

g. $14m^5 - 7m^2 = 7m^2(2m^3 - 1)$

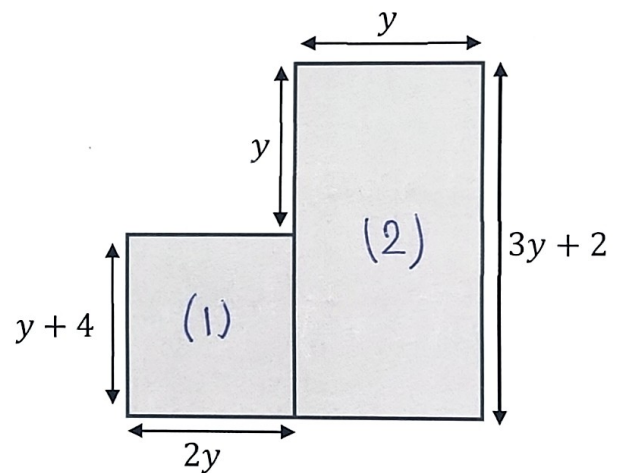
h. $9b^6 - 3b^3 = 3b^3(3b^3 - 1)$

Q6: Write an expression for the total area of this shape.

A(1): $2y(y + 4) = 2y^2 + 8y$

A(2): $y(3y + 2) = 3y^2 + 2y$

Total area: $2y^2 + 8y + 3y^2 + 2y$
 $= 5y^2 + 10y$



Q7: Show that both of these statements are identities.

i. $6y^3 + y(4y^2 + 5y) \equiv 5y^2(2y + 1)$

LHS $6y^3 + 4y^3 + 5y^2 = 10y^3 + 5y^2$

RHS $5y^2(2y + 1) = 10y^3 + 5y^2$

LHS and RHS both simplify $10y^3 + 5y^2$

$$\text{ii. } 4p(p^2 - 3p) - p(p^2 - 15p) \equiv 3p^2(p + 1)$$

$$\text{LHS: } \underline{4p^3} - \underline{12p^2} - \underline{p^3} + \underline{15p^2} = \boxed{3p^3 + 3p^2}$$

$$\text{RHS: } 3p^2(p + 1) = \boxed{3p^3 + 3p^2}$$

LHS and RHS both simplify to $3p^3 + 3p^2$

3.5 Substituting and Solving

Q1: Rectangle A has area $y \text{ cm}^2$. Rectangle B has area $(y + 18) \text{ cm}^2$.

The area of rectangle B is three times the area of rectangle A.

a. Write an equation using the information given.

$$3y = y + 18$$

b. Solve the equation to find the value of y .

$$\begin{array}{r} 3y = y + 18 \\ -y \quad -y \\ \hline \end{array}$$

$$\frac{2y}{2} = \frac{18}{2}$$

$$y = 9$$

Q2: Find the value of these linear expressions when $a = 9$, $b = 4$ and $c = -2$.

a. $5a + 4c$

$$= 5 \times 9 + 4 \times -2$$

$$= 45 + -8$$

$$= 37$$

b. $3(a + 1) + b + c$

$$3(9 + 1) + 4 + -2$$

$$3(10) + 4 + -2$$

$$30 + 4 + -2$$

$$34 - 2$$

$$= 32$$

$$c. 4(b - c) - 3a$$

$$\begin{aligned} &= 4(4 - -2) - 3 \times 9 \\ &= 4(4 + 2) - 27 \\ &= 4(6) - 27 \\ &= 24 - 27 \\ &= -3 \end{aligned}$$

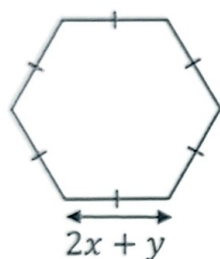
$$d. 2(a + b) - 5(b + c)$$

$$\begin{aligned} &2(9 + 4) - 5(4 + -2) \\ &= 2(13) - 5(2) \\ &= 26 - 10 \\ &= 16 \end{aligned}$$

Q3: For each shape

- Write and simplify an expression for the perimeter.
- Work out the perimeter when $x = 5$ and $y = -3$.

i.



$$a) 6(2x + y) = 12x + 6y$$

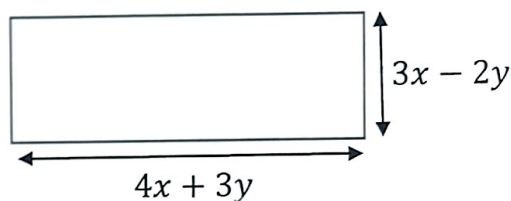
$$b) 12 \times 5 + 6 \times -3$$

$$= 60 \text{ } (+ -) 18$$

$$= 60 - 18$$

$$= 42$$

ii.



$$\begin{aligned} a) &2(4x + 3y) + 2(3x - 2y) \\ &= 8x + 6y + 6x - 4y \\ &= 14x + 2y \end{aligned}$$

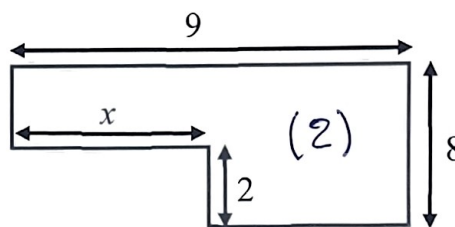
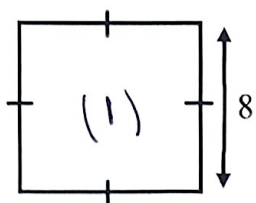
$$b) 14 \times 5 + 2 \times -3$$

$$= 70 \text{ } (+ -) 6$$

$$= 70 - 6$$

$$= 64$$

Q4: These two shapes have the same area. Work out the value of x .



$$\text{Area}(1) = \text{Area}(2)$$

$$8^2 = 9 \times 8 - 2 \times x$$

$$\begin{array}{r} 64 = 72 - 2x \\ -72 \quad -72 \end{array}$$

$$\begin{array}{r} -8 = -2x \\ \hline -2 \quad -2 \end{array}$$

$$4 = x$$

$$\boxed{\text{So, } x = 4}$$

Q5: Substitute $a = 4$, $b = 5$ and $c = -3$.

a. $2a(a + b)$

$$\begin{aligned} & 2 \times 4(4 + 5) \\ &= 8(9) \\ &= 72 \end{aligned}$$

b. $c^2(c + b^2)$

$$\begin{aligned} & (-3)^2(-3 + 5^2) \\ &= 9(-3 + 25) \\ &= 9(22) \\ &= 198 \end{aligned}$$

$$c. 3a(10 + c) + b^2$$

$$= 3 \times 4(10 + -3) + 5^2$$

$$= 12(7) + 25$$

$$= 84 + 25$$

$$= 109$$

$$d. 2c(4a - b) + c^2$$

$$= 2 \times -3(4 \times 4 - 5) + (-3)^2$$

$$= -6(16 - 5) + 9$$

$$= -6(11) + 9$$

$$= -66 + 9$$

$$= -57$$

Q6: A square with sides $3y$ is cut out of a rectangle with sides $5y + 4$ and $6y$.

a. Write an expression, in terms of y , for the area of the remaining shape.

$$6y(5y + 4) - 3y \times 3y$$

$$= 30y^2 + 24y - 9y^2$$

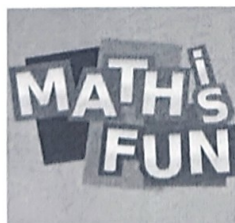
$$= 27y^2 + 24y$$

b. Use your expression to find the area of the remaining shape when $y = 3$.

$$27 \times 3^2 + 24 \times 3$$

$$= 243 + 72$$

$$= 315$$



Teachers:- Zein Abbasi, Rand Haddadin