بِسۡمِ اللّٰهِ الرَّحۡمٰنِ الرَّحِيۡمِ

“In the name of Allah ,the Most Beneficent ,the Most Merciful.”

شروع کوم په نامه د الله(ج) چې رحمٰن او رحیم دی.

Narrated Umar bin Al-Khattab (RA): I heard Allah’s Messenger (SAW) saying, “The reward of deeds depends upon the intentions and every person will get the reward according to what he has intended. So whoever emigrates for worldly benefits or for a woman to marry, his emigration will be for what he emigrated for” **(Al-Bukhari)**

ګرانو او قدرمنو وروڼو اوخویندو!
السلام علیکم ورحمت الله وبرکاته!

له الله(ج) څخه هیله کوم چې تاسې ټول روغ او جوړ وئ.

دغه لاندې د ریاضي درسونه ما د انګلستان په یوه ښار کې چې سوتهمپټن نومېږي، د افغانانو اولادونو ته خاص د ثواب په خاطر درس ورکاوه. که چېرې دغه درسونه په صحیح توګه پکار واچول شي، نو ان شاءالله ځینې پلرونو او د دوی اولادونو ته به ګټور وي.

نوټ: دغه لړۍ به ان شاءالله، له لومړي ټولګي څخه تر پوهنتون پورې ان شاءالله، دوام ولري.

د یادونې وړ ده، چې زما مسلک ریاضي نده، او ما خپلې زده کړې، د دکتورا تر کچې د الکترانکس په برخه کې، په انګلستان کې سرته رسولې. همدارنګه، ما ۶ کاله د کابل پوهنتون، د انجینرۍ په پوهنځی، او ۲۷ کاله د انګلستان په یوه پوهنتون کې معلمي کړېده. یعنې هغه چا چې په الکترانکس انجینرنګ کې زده کړې کړې وي، نو هغه د ریاضي په قدر پوهیږي. زه به له ریاضي درسونو وروسته، د الکترانکس په برخه کې به ان شاءالله درسونه شروع کړم.

Dear Brothers and Sisters! **السلام علیکم و رحمت الله و برکاته**

I kindly request each one of you to remember me, my parents, my children, my family and the entire Muslims of the world in your daily Prayers.

ګرانو او قدرمنو وروڼو اوخویندو!
السلام علیکم ورحمت الله وبرکاته!

له الله(ج) څخه هیله کوم چې تاسې ټول روغ او جوړ وئ، او الله(ج) د وکړي چې ماته ، زما مور او پلار ته ، زما اولادونو ته ، زما ټولې کورنۍ ته او د نړۍ ټولو مسلمانانو ته ، د زړه له کومې دعا وکړئ. والسلام

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Lesson No.9

Brackets

نهم درس(لوست)

Brackets

Multiplying out Brackets

Example: **Simplify** $2(4x+6)$.

Ans: Multiply THE TERMS.

$$2(4x + 6) = 8x + 12$$

Example: **Simplify** $3q(5r - 4q)$.

Ans: Multiply THE TERMS.

$$3q(5r - 4q) = 15qr - 12q^2$$

Example: **Simplify** $-5(2a - 3b)$.

Ans: Multiply THE TERMS

$$-5(2a - 3b) = -10a + 15b$$

Example: **Simplify** $(2a-5)(3a+1)$.

Ans: Multiply THE TERMS

$$(2a-5)(3a+1)=6a^2+2a-15a-5=6a^2-13a-5$$

Example: **Simplify** $(5t+3)(5t+3)$.

Ans: Multiply THE TERMS

$$(5t+3)(5t+3)=25t^2+15t+15t+9=25t^2+30t+9$$

Example: **Factorise** $6x^4y+8x^2y^3z-12x^3yz^2$.

Ans: Take out THE COMMON TERMS

$$6x^4y+8x^2y^3z-12x^3yz^2$$
$$2\left(3x^4y+4x^2y^3z-6x^3yz^2\right)$$
$$2x^2y\left(3x^2+4y^2z-6xz^2\right)$$
$$2x^2y\left(3x^2+4y^2z-6xz^2\right)$$

2 is the biggest number that is common in 6, 8, 12 → $2x^2y\left(3x^2+4y^2z-6xz^2\right)$

Highest powers of ***x*** and ***y*** that is common in all three terms

z wasn't in ALL terms so it can't come out as a common factor

Example: **Simplify** $-4x+2y-2-y+x$.

Ans: Combine LIKE TERMS

$$-4x+2y-2-y+x=-3x+y-2$$

Number term

Example: **Simplify** $8w+6k-5w-12k^2+8$.

Ans: Combine LIKE TERMS

$$8w+6k-5w-12k^2+8=3w+6k-12k^2+8$$

Example: **Expand** $2ab(4a-3b^2)$.

Ans: Multiply THE TERMS

$$2ab(4a-3b^2)=8a^2b-6ab^3$$

Example: **Expand** $(2f+3)(5f-4)$.

Ans: Multiply THE TERMS

$$(2f+3)(5f-4)=10f^2-8f+15f-12=10f^2+7f-12$$

Example: **Expand** $(1-2x)^2$.

Ans: Multiply THE TERMS

$$(1-2x)(1-2x)=1-2x-2x+4x^2=4x^2-4x+1$$

Example: **Expand** $(3x-2)^2$.

Ans: Multiply THE TERMS

$$(3x-2)(3x-2)=9x^2-6x-6x+4=9x^2-12x+4$$

Example: **Factorise** $12q^2r^3-24q^2r+30q^3r^4$.

Ans: Take out THE COMMON TERMS

$$12q^2r^3-24q^2r+30q^3r^4$$

6 is the biggest number that is common in 6, 8, 12 $\longrightarrow 6q^2r\left(2r^2-4+5qr^3\right)$

Highest powers of ***q*** and ***r*** that is common in all three terms

Example: **Factorise** $6x^3y^2 - 3x^2y + 12xy^3z$

Ans: Take out THE COMMON TERMS

$$6x^3y^2 - 3x^2y + 12xy^3z$$

3 is the biggest number that is common in 6, 8, 12 → $3xy\left(2x^2y - x + 4y^2z\right)$

Highest powers of ***x*** and ***y*** that is common in all three terms

z wasn't in ALL terms so it can't come out as a common factor

Example: **Simplify** $3(3x-8)$.

Ans: $3(3x-8) = 9x - 24$

Example: **Simplify** $3(3a-8b)$

Ans: $3(3a-8b) = 9a - 24b$

Example: **Simplify** $3a(3a-8b)$

Ans: $3a(3a-8b) = 9a^2 - 24ab$

Example: **Simplify** $3a^2(3a-8b)$

Ans: $3a^2(3a-8b) = 9a^3 - 24a^2b$

Example: **Simplify** $\frac{3}{4}ab^2 + \frac{1}{2}a^2b^3 - \frac{5}{7}abc$.

Ans: $\frac{3}{4}ab^2 + \frac{1}{2}a^2b^3 - \frac{5}{7}abc = ab\left(\frac{3}{4}b + \frac{1}{2}ab^2 - \frac{5}{7}c\right)$

Example: **Simplify** $\frac{3}{4}a^2b + \frac{1}{2}ab^3 - \frac{3}{8}ab$.

Ans: $\frac{3}{4}a^2b + \frac{1}{2}ab^3 - \frac{3}{8}ab = \frac{1}{2}ab\left(\frac{3}{2}a + b^2 - \frac{3}{4}\right)$ **Note:** $\frac{3}{4} = \frac{1}{2} \times \frac{3}{2}$ and $\frac{3}{8} = \frac{1}{2} \times \frac{3}{4}$

Example: **Simplify** $3(3x-8) + 4(5-2x) - 5(2x-7)$.

Ans: $3(3x-8) + 4(5-2x) - 5(2x-7) = 9x - 24 + 20 - 8x - 10x + 35 = -9x + 31$

Example: **Simplify** $-3(-3x-8) + 4(-5-2x) - 5(2x-7)$.

Ans: $-3(-3x-8) + 4(-5-2x) - 5(2x-7) = 9x + 24 - 20 - 8x - 10x + 35 = -9x + 39$

Example: Simplify $\frac{x+2}{3}+\frac{x-3}{2}-\frac{2x+3}{5}$.

Ans:

$$\frac{x+2}{3}+\frac{x-3}{2}-\frac{2x+3}{5}=\frac{10(x+2)+15(x-3)-6(2x+3)}{30}=\frac{10x+20+15x-45-12x-18}{30}=\frac{13x-43}{30}$$

Example: Simplify $\frac{x+2}{3}\times\frac{x-3}{2}$

Ans: $\frac{x+2}{3}\times\frac{x-3}{2}=\frac{(x+2)(x-3)}{3\times 2}=\frac{x^2-3x+2x-6}{6}=\frac{x^2-x-6}{6}$

Example: Simplify $\frac{x+2}{5}\times\frac{4}{x+3}$

Ans: $\frac{x+2}{5}\times\frac{4}{x+3}=\frac{4(x+2)}{5(x+3)}=\frac{4x+8}{5x+15}$

Example: Simplify $\frac{x+2}{3}\div\frac{x-3}{2}$

Ans: $\frac{x+2}{3}\div\frac{x-3}{2}=\frac{x+2}{3}\times\frac{2}{x-3}=\frac{2(x+2)}{3(x-3)}=\frac{2x+4}{3x-9}$

Example: Simplify $\frac{x+7}{6}\div\frac{5}{x-4}$

Ans: $\frac{x+7}{6}\div\frac{5}{x-4}=\frac{x+7}{6}\times\frac{x-4}{5}=\frac{(x+7)(x-4)}{6\times 5}=\frac{x^2-4x+7x-28}{30}=\frac{x^2+3x-28}{30}$

Exercises

1. Expand and simplify the following expressions.

   (a) $(x+4)(x+5)$ (b) $(3x-2)(5x-3)$ (c) $(2-3x)(2x-3)$

2. Expand and simplify the following expressions.

   (a) $(3y-4)(2y+5)$ (b) $(3a-4)(5a-7)$ (c) $(3-2t)(4t+5)$

3. Expand and simplify the following expressions.

(a) $(3y-4)(2y+5)-(2y-3)(3y+4)$ (b) $(2x-3)(3x+4)-3(2x-3)$

4. Factorise $2x^2y^2 + 4x^2y - 6xy^3z$

5. Factorise $xy^2 + 3x^2y - 2xyz$

6. Simplify the following expressions.

(a) $\frac{2}{3}x^2y+\frac{5}{6}xy^3-\frac{4}{9}xy$ (b) $\frac{2}{5}a^2b+\frac{3}{10}ab^3-\frac{4}{25}ab$

7. Simplify the following expressions.

(a) $(1+4x)(3-5x)$ (b) $(1-4x)^2$ (c) $(x-y)^3$

8. Expand and simplify the following expressions.

(a) $(3y-4)(2y+5)-(2x-3)(3x+4)$ (b) $(2a-3)(3a+4)-3(2b-3)$

Solutions to Exercises

1. Expand and simplify the following expressions.

(a) $(x+4)(x+5)$ (b) $(3x-2)(5x-3)$ (c) $(2-3x)(2x-3)$

Ans:

(a) $(x+4)(x+5)=x^2+5x+4x+20=x^2+9x+20$

(b) $(3x-2)(5x-3)=15x^2-9x-10x+6=15x^2-19x+6$

(c) $(2-3x)(2x-3)=4x-6-6x^2+9x=-6x^2+13x-6$

2. Expand and simplify the following expressions.

(a) $(3y-4)(2y+5)$ (b) $(3a-4)(5a-7)$ (c) $(3-2t)(4t+5)$

Ans:

(a) $(3y-4)(2y+5)=6y^2+15y-8y-20=6y^2+7y-20$

(b) $(3a-4)(5a-7)=15a^2-21a-20a+28=15a^2-41a+28$

(c) $(3-2t)(4t+5)=12t+15-8t^2-10t=-8t^2+2t+15$

3. Expand and simplify the following expressions.

(a) $(3y-4)(2y+5)-(2y-3)(3y+4)$ (b) $(2x-3)(3x+4)-3(2x-3)$

Ans:

(a) $(3y-4)(2y+5)-(2y-3)(3y+4)=6y^2+15y-8y-20-(6y^2+8y-9y-12)$
$=6y^2+7y-20-6y^2-8y+9y+12=8y-8$

(b) $(2x-3)(3x+4)-3(2x-3)=6x^2+8x-9x-12-6x+9=6x^2-7x-3$

4. Factorise $2x^2y^2+4x^2y-6xy^3z$

Ans: Take out THE COMMON TERMS
$2x^2y^2+4x^2y-6xy^3z=2xy(xy+2x-3y^2z)$

5. Factorise $xy^2+3x^2y-2xyz$

Ans: Take out THE COMMON TERMS
$xy^2+3x^2y-2xyz=xy(y+3x-2z)$

6. Simplify the following expressions.

(a) $\frac{2}{3}x^2y+\frac{5}{6}xy^3-\frac{4}{9}xy$ (b) $\frac{2}{5}a^2b+\frac{3}{10}ab^3-\frac{4}{25}ab$

Ans: (a) $\frac{2}{3}x^2y+\frac{5}{6}xy^3-\frac{4}{9}xy=xy\left(\frac{2}{3}x+\frac{5}{6}y^2-\frac{4}{9}\right)=\frac{1}{3}xy\left(2x+\frac{5}{2}y^2-\frac{4}{3}\right)$

(b) $\frac{2}{5}a^2b+\frac{3}{10}ab^3-\frac{4}{25}ab=ab\left(\frac{2}{5}a+\frac{3}{10}b^2-\frac{4}{25}\right)=\frac{1}{5}ab\left(2a+\frac{3}{2}b^2-\frac{4}{5}\right)$

7. Simplify the following expressions.

(a) $(1+4x)(3-5x)$ (b) $(1-4x)^2$ (c) $(x-y)^3$

Ans: (a) $(1+4x)(3-5x)=3-5x+12x-20x^2=-20x^2+7x+3$

(b) $(1-4x)^2=(1-4x)(1-4x)=1-4x-4x+16x^2=16x^2-8x+1$

(c)
$(x-y)^3=(x-y)^2(x-y)=(x^2-2xy+y^2)(x-y)=x^3-x^2y-2x^2y+2xy^2+xy^2-y^3=x^3-3x^2y+3xy^2-y^3$

8. Expand and simplify the following expressions.

(a) $(3y-4)(2y+5)-(2x-3)(3x+4)$ (b) $(2a-3)(3a+4)-3(2b-3)$

Ans:

(a) $(3y-4)(2y+5)-(2x-3)(3x+4)=6y^2+15y-8y-20-(6x^2+8x-9x-12)$
$=6y^2+7y-20-6x^2-8x+9x+12=6y^2+7y-6x^2+x-8$

(b) $(2a-3)(3a+4)-3(2b-3)=6a^2+8a-9a-12-6b+9=6a^2-a-6b-3$

الله(ج) د وکړي چې تاسې ما ته، زما مور او پلار ته، زما اولادونو ته، زما ټولې کورنۍ اوټولو مسلمانانو ته د زړه له کومې دعا کړيې وي، **اوکنه؟** نو اوس يې لطفاً وکړئ!

په پای کې له تاسو ټولو سره له لرې ځايه خدای په اماني کوم۰ له الله(ج) څخه هيله کوم چې په افغانستان او په ټوله نړۍ کې هغه شانته صلح راشي، چې الله(ج) ته مقبوله او منظوره وي، او الله(ج) دې، د افغانانو ترمنځ د حق فيصله وکړي۰ آمين يارب العٰلمين۰