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1. Verify the property: x × y = y × x by taking:
(i) x = -1/3, y = 2/7
Solution:
By using the property
x × y = y × x
-1/3 × 2/7 = 2/7 × -1/3
(-1×2)/(3×7) = (2×-1)/(7×3)
-2/21 = -2/21
Hence, the property is satisfied.

(ii) x = -3/5, y = -11/13
Solution:
By using the property
x × y = y × x
-3/5 × -11/13 = -11/13 × -3/5
(-3×-11)/(5×13) = (-11×-3)/(13×5)
33/65 = 33/65
Hence, the property is satisfied.

(iii) x = 2, y = 7/-8
Solution:
By using the property
x × y = y × x
2 × 7/-8 = 7/-8 × 2
(2×7)/-8 = (7×2)/-8
14/-8 = 14/-8
-14/8 = -14/8
Hence, the property is satisfied.

(iv) x = 0, y = -15/8
Solution:
By using the property
x × y = y × x
0 × -15/8 = -15/8 × 0
0 = 0
Hence, the property is satisfied.

2. Verify the property: x × (y × z) = (x × y) × z by taking:
(i) x = -7/3, y = 12/5, z = 4/9
Solution:
By using the property
x × (y × z) = (x × y) × z
-7/3 × (12/5 × 4/9) = (-7/3 × 12/5) × 4/9
(-7×12×4)/(3×5×9) = (-7×12×4)/(3×5×9)
-336/135 = -336/135
Hence, the property is satisfied.

(ii) x = 0, y = -3/5, z = -9/4
Solution:
By using the property
x × (y × z) = (x × y) × z
0 × (-3/5 × -9/4) = (0 × -3/5) × -9/4
0 = 0
Hence, the property is satisfied.

(iii) x = 1/2, y = 5/-4, z = -7/5
Solution:
By using the property
x × (y × z) = (x × y) × z
1/2 × (5/-4 × -7/5) = (1/2 × 5/-4) × -7/5
(1×5×-7)/(2×-4×5) = (1×5×-7)/(2×-4×5)
-35/-40 = -35/-40
35/40 = 35/40
Hence, the property is satisfied.

(iv) x = 5/7, y = -12/13, z = -7/18
Solution:
By using the property
x × (y × z) = (x × y) × z
5/7 × (-12/13 × -7/18) = (5/7 × -12/13) × -7/18
(5×-12×-7)/(7×13×18) = (5×-12×-7)/(7×13×18)
420/1638 = 420/1638
Hence, the property is satisfied.

3. Verify the property: x × (y + z) = x × y + x × z by taking:
(i) x = -3/7, y = 12/13, z = -5/6
Solution:
By using the property
x × (y + z) = x × y + x × z

-3/7 × (12/13 + -5/6)	= -3/7 × 12/13 + -3/7 × -5/6
-3/7 × ((12×6) + (-5×13))/78	= (-3×12)/(7×13) + (-3×-5)/(7×6)
-3/7 × (72-65)/78	= -36/91 + 15/42
-3/7 × 7/78	= (-36×6 + 15×13)/546
-1/26	= (196-216)/546
	= -21/546
	= -1/26

Hence, the property is verified.

(ii) x = -12/5, y = -15/4, z = 8/3
Solution:
By using the property
x × (y + z) = x × y + x × z

-12/5 × (-15/4 + 8/3)	= -12/5 × -15/4 + -12/5 × 8/3
-12/5 × ((-15×3) + (8×4))/12	= (-12×-15)/(5×4) + (-12×8)/(5×3)
-12/5 × (-45+32)/12	= 180/20 - 96/15
-12/5 × -13/12	= 9 – 32/5
13/5	= (9×5 - 32×1)/5
	= (45-32)/5
	= 13/5

Hence, the property is verified.

(iii) x = -8/3, y = 5/6, z = -13/12
Solution:
By using the property
x × (y + z) = x × y + x × z

-8/3 × (5/6 + -13/12)	= -8/3 × 5/6 + -8/3 × -13/12
-8/3 × ((5×2) - (13×1))/12	= (-8×5)/(3×6) + (-8×-13)/(3×12)
-8/3 × (10-13)/12	= -40/18 + 104/36
-8/3 × -3/12	= (-40×2 + 104×1)/36
2/3	= (-80+104)/36
	= 24/36
	= 2/3

Hence, the property is verified.

(iv) x = -3/4, y = -5/2, z = 7/6
Solution:
By using the property
x × (y + z) = x × y + x × z

-3/4 × (-5/2 + 7/6)	= -3/4 × -5/2 + -3/4 × 7/6
-3/4 × ((-5×3) + (7×1))/6	= (-3×-5)/(4×2) + (-3×7)/(4×6)
-3/4 × (-15+7)/6	= 15/8 - 21/24
-3/4 × -8/6	= (15×3 - 21×1)/24
-3/4 × -4/3	= (45-21)/24
1	= 24/24
	= 1

Hence, the property is verified.

4. Use the distributivity of multiplication of rational numbers over their addition to simplify:
(i) 3/5 × ((35/24) + (10/1))
Solution:
3/5 × 35/24 + 3/5 × 10
1/1 × 7/8 + 6/1
By taking LCM for 8 and 1 which is 8
7/8 + 6 = (7×1 + 6×8)/8
= (7+48)/8
= 55/8

(ii) -5/4 × ((8/5) + (16/5))
Solution:
-5/4 × 8/5 + -5/4 × 16/5
-1/1 × 2/1 + -1/1 × 4/1
-2 + -4
-2 – 4
-6

(iii) 2/7 × ((7/16) - (21/4))
Solution:
2/7 × 7/16 - 2/7 × 21/4
1/1 × 1/8 - 1/1 × 3/2
1/8 – 3/2
By taking LCM for 8 and 2 which is 8
1/8 – 3/2 = (1×1 - 3×4)/8

= (1 - 12)/8
= -11/8

(iv) 3/4 × ((8/9) - 40)
Solution:
3/4 × 8/9 - 3/4 × 40
1/1 × 2/3 - 3/1 × 10
2/3 – 30/1
By taking LCM for 3 and 1 which is 3
2/3 – 30/1 = (2×1 - 30×3)/3
= (2 - 90)/3
= -88/3

5. Find the multiplicative inverse (reciprocal) of each of the following rational numbers:
(i) 9
(ii) -7
(iii) 12/5
(iv) -7/9
(v) -3/-5
(vi) 2/3 × 9/4
(vii) -5/8 × 16/15
(viii) -2 × -3/5
(ix) -1
(x) 0/3
(xi) 1
Solution:
(i) The reciprocal of 9 is 1/9

(ii) The reciprocal of -7 is -1/7

(iii) The reciprocal of 12/5 is 5/12

(iv) The reciprocal of -7/9 is 9/-7

(v) The reciprocal of -3/-5 is 5/3

(vi) The reciprocal of 2/3 × 9/4 is
Firstly solve for 2/3 × 9/4 = 1/1 × 3/2 = 3/2

∴ The reciprocal of 3/2 is 2/3

(vii) The reciprocal of -5/8 × 16/15
Firstly solve for -5/8 × 16/15 = -1/1 × 2/3 = -2/3
∴ The reciprocal of -2/3 is 3/-2

(viii) The reciprocal of -2 × -3/5
Firstly solve for -2 × -3/5 = 6/5
∴ The reciprocal of 6/5 is 5/6

(ix) The reciprocal of -1 is -1

(x) The reciprocal of 0/3 does not exist

(xi) The reciprocal of 1 is 1

**6. Name the property of multiplication of rational numbers illustrated by the
following statements:**
(i) -5/16 × 8/15 = 8/15 × -5/16
(ii) -17/5 ×9 = 9 × -17/5
(iii) 7/4 × (-8/3 + -13/12) = 7/4 × -8/3 + 7/4 × -13/12
(iv) -5/9 × (4/15 × -9/8) = (-5/9 × 4/15) × -9/8
(v) 13/-17 × 1 = 13/-17 = 1 × 13/-17
(vi) -11/16 × 16/-11 = 1
(vii) 2/13 × 0 = 0 = 0 × 2/13
(viii) -3/2 × 5/4 + -3/2 × -7/6 = -3/2 × (5/4 + -7/6)
Solution:

(i) -5/16 × 8/15 = 8/15 × -5/16
According to commutative law, a/b × c/d = c/d × a/b
The above rational number satisfies commutative property.

(ii) -17/5 ×9 = 9 × -17/5
According to commutative law, a/b × c/d = c/d × a/b
The above rational number satisfies commutative property.

(iii) 7/4 × (-8/3 + -13/12) = 7/4 × -8/3 + 7/4 × -13/12
According to given rational number, a/b × (c/d + e/f) = (a/b × c/d) + (a/b × e/f)
Distributivity of multiplication over addition satisfies.

(iv) -5/9 × (4/15 × -9/8) = (-5/9 × 4/15) × -9/8
According to associative law, a/b × (c/d × e/f) = (a/b × c/d) × e/f
The above rational number satisfies associativity of multiplication.

(v) 13/-17 × 1 = 13/-17 = 1 × 13/-17
Existence of identity for multiplication satisfies for the given rational number.

(vi) -11/16 × 16/-11 = 1
 Existence of multiplication inverse satisfies for the given rational number.

(vii) 2/13 × 0 = 0 = 0 × 2/13
By using a/b × 0 = 0 × a/b
Multiplication of zero satisfies for the given rational number.

(viii) -3/2 × 5/4 + -3/2 × -7/6 = -3/2 × (5/4 + -7/6)
According to distributive law, (a/b × c/d) + (a/b × e/f) = a/b × (c/d + e/f)
The above rational number satisfies commutative property.

7. Fill in the blanks:
(i) The product of two positive rational numbers is always…
(ii) The product of a positive rational number and a negative rational number is always….
(iii) The product of two negative rational numbers is always…
(iv) The reciprocal of a positive rational numbers is…
(v) The reciprocal of a negative rational numbers is…
(vi) Zero has …. Reciprocal.
(vii) The product of a rational number and its reciprocal is…
(viii) The numbers … and … are their own reciprocals.
(ix) If a is reciprocal of b, then the reciprocal of b is.
(x) The number 0 is … the reciprocal of any number.
(xi) reciprocal of 1/a, a ≠ 0 is …
(xii) $(17 \times 12)^{-1} = 17^{-1} \times$ …
Solution:

(i) The product of two positive rational numbers is always positive.
(ii) The product of a positive rational number and a negative rational number is always negative.
(iii) The product of two negative rational numbers is always positive.
(iv) The reciprocal of a positive rational numbers is positive.

(v) The reciprocal of a negative rational numbers is negative.
(vi) Zero has no Reciprocal.
(vii) The product of a rational number and its reciprocal is 1.
(viii) The numbers 1 and -1 are their own reciprocals.
(ix) If a is reciprocal of b, then the reciprocal of b is a.
(x) The number 0 is not the reciprocal of any number.
(xi) reciprocal of 1/a, a ≠ 0 is a.
(xii) $(17 \times 12)^{-1} = 17^{-1} \times 12^{-1}$

8. Fill in the blanks:
(i) -4 × 7/9 = 79 × …
Solution:
-4 × 7/9 = 79 × -4
By using commutative property.

(ii) 5/11 × -3/8 = -3/8 × …
Solution:
5/11 × -3/8 = -3/8 × 5/11
By using commutative property.

(iii) 1/2 × (3/4 + -5/12) = 1/2 × … + … × -5/12
Solution:
1/2 × (3/4 + -5/12) = 1/2 × 3/4 + 1/2 × -5/12
By using distributive property.

(iv) -4/5 × (5/7 + -8/9) = (-4/5 × …) + -4/5 × -8/9
Solution:
-4/5 × (5/7 + -8/9) = (-4/5 × 5/7) + -4/5 × -8/9
By using distributive property.