

EXERCISE 14.3

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1. Carry out the following divisions.

(i) $28x^4 \div 56x$

(ii) $-36y^3 \div 9y^2$

(iii) $66pq^2r^3 \div 11qr^2$

(iv) $34x^3y^3z^3 \div 51xy^2z^3$

(v) $12a^8b^8 \div (-6a^6b^4)$

Solution:

(i) $28x^4 = 2 \times 2 \times 7 \times x \times x \times x \times x$

$56x = 2 \times 2 \times 2 \times 7 \times x$

$$28x^4 \div 56x = \frac{2 \times 2 \times 7 \times x \times x \times x \times x}{2 \times 2 \times 2 \times 7 \times x} = \frac{x^3}{2} = \frac{1}{2}x^3$$

$$(ii) -36y^3 \div 9y^2 = \frac{-2 \times 2 \times 3 \times 3 \times y \times y \times y}{3 \times 3 \times y \times y} = -4y$$

$$(iii) 66pq^2r^3 \div 11qr^2 = \frac{2 \times 3 \times 11 \times p \times q \times q \times r \times r \times r}{11 \times q \times r \times r} = 6pqr$$

$$(iv) 34x^3y^3z^3 \div 51xy^2z^3 = \frac{2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z}{3 \times 17 \times x \times y \times y \times z \times z \times z} = \frac{2}{3}x^2y$$

$$(v) 12a^8b^8 \div (-6a^6b^4) = \frac{2 \times 2 \times 3 \times a^8 \times b^8}{-2 \times 3 \times a^6 \times b^4} = -2a^2b^4$$

2. Divide the given polynomial by the given monomial.

(i) $(5x^2 - 6x) \div 3x$

(ii) $(3y^8 - 4y^6 + 5y^4) \div y^4$

(iii) $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2$

(iv) $(x^3 + 2x^2 + 3x) \div 2x$

(v) $(p^3q^6 - p^6q^3) \div p^3q^3$

Solution:

(i) $5x^2 - 6x = x(5x - 6)$

$$(5x^2 - 6x) \div 3x = \frac{x(5x - 6)}{3x} = \frac{1}{3}(5x - 6)$$

(ii) $3y^8 - 4y^6 + 5y^4 = y^4(3y^4 - 4y^2 + 5)$

$$(3y^8 - 4y^6 + 5y^4) \div y^4 = \frac{y^4(3y^4 - 4y^2 + 5)}{y^4} = 3y^4 - 4y^2 + 5$$

(iii) $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) = 8x^2y^2z^2(x + y + z)$

$$8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2 = \frac{8x^2y^2z^2(x + y + z)}{4x^2y^2z^2} = 2(x + y + z)$$

(iv) $x^3 + 2x^2 + 3x = x(x^2 + 2x + 3)$

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

(v) $p^3q^6 - p^6q^3 = p^3q^3(q^3 - p^3)$

$$(p^3q^6 - p^6q^3) \div p^3q^3 = \frac{p^3q^3(q^3 - p^3)}{p^3q^3} = q^3 - p^3$$

3. Work out the following divisions.

(i) $(10x - 25) \div 5$

(ii) $(10x - 25) \div (2x - 5)$

(iii) $10y(6y + 21) \div 5(2y + 7)$

(iv) $9x^2y^2(3z - 24) \div 27xy(z - 8)$

(v) $96abc(3a - 12)(5b - 30) \div 144(a - 4)(b - 6)$

Solution:

(i) $(10x - 25) \div 5 = 5(2x - 5)/5 = 2x - 5$

(ii) $(10x - 25) \div (2x - 5) = 5(2x - 5)/(2x - 5) = 5$

(iii) $10y(6y + 21) \div 5(2y + 7) = 10y \times 3(2y + 7)/5(2y + 7) = 6y$

(iv) $9x^2y^2(3z - 24) \div 27xy(z - 8) = 9x^2y^2 \times 3(z - 8)/27xy(z - 8) = xy$

$$(v) \underline{96abc(3a-12)(5b-30)} \div 144(a-4)(b-6) = \frac{96abc \times 3(a-4) \times 5(b-6)}{144(a-4)(b-6)} = 10abc$$

4. Divide as directed.

(i) $5(2x+1)(3x+5) \div (2x+1)$

(ii) $26xy(x+5)(y-4) \div 13x(y-4)$

(iii) $52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p)$

(iv) $20(y+4)(y^2+5y+3) \div 5(y+4)$

(v) $x(x+1)(x+2)(x+3) \div x(x+1)$

Solution:

$$(i) \quad 5(2x+1)(3x+5) \div (2x+1) = \frac{5(2x+1)(3x+5)}{(2x+1)} \\ = 5(3x+5)$$

$$(ii) \quad 26xy(x+5)(y-4) \div 13x(y-4) = \frac{2 \times 13 \times xy(x+5)(y-4)}{13x(y-4)} \\ = 2y(x+5)$$

$$(iii) \quad 52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p) \\ = \frac{2 \times 2 \times 13 \times p \times q \times r \times (p+q) \times (q+r) \times (r+p)}{2 \times 2 \times 2 \times 13 \times p \times q \times (q+r) \times (r+p)} \\ = \frac{1}{2}r(p+q)$$

$$(iv) \quad 20(y+4)(y^2+5y+3) \div 5(y+4) = \frac{2 \times 2 \times 5 \times (y+4) \times (y^2+5y+3)}{5 \times (y+4)} \\ = 4(y^2+5y+3)$$

$$(v) \quad x(x+1)(x+2)(x+3) \div x(x+1) = \frac{x(x+1)(x+2)(x+3)}{x(x+1)} \\ = (x+2)(x+3)$$

5. Factorise the expressions and divide them as directed.

(i) $(y^2+7y+10) \div (y+5)$

(ii) $(m^2-14m-32) \div (m+2)$

(iii) $(5p^2-25p+20) \div (p-1)$

(iv) $4yz(z^2+6z-16) \div 2y(z+8)$

(v) $5pq(p^2 - q^2) \div 2p(p+q)$

(vi) $12xy(9x^2 - 16y^2) \div 4xy(3x+4y)$

(vii) $39y^3(50y^2 - 98) \div 26y^2(5y+7)$

Solution:

(i) $(y^2 + 7y + 10) \div (y+5)$

First, solve the equation $(y^2 + 7y + 10)$

$$(y^2 + 7y + 10) = y^2 + 2y + 5y + 10 = y(y+2) + 5(y+2) = (y+2)(y+5)$$

$$\text{Now, } (y^2 + 7y + 10) \div (y+5) = (y+2)(y+5)/(y+5) = y+2$$

(ii) $(m^2 - 14m - 32) \div (m+2)$

Solve for $m^2 - 14m - 32$, we have

$$m^2 - 14m - 32 = m^2 + 2m - 16m - 32 = m(m+2) - 16(m+2) = (m-16)(m+2)$$

$$\text{Now, } (m^2 - 14m - 32) \div (m+2) = (m-16)(m+2)/(m+2) = m-16$$

(iii) $(5p^2 - 25p + 20) \div (p-1)$

Step 1: Take 5 common from the equation, $5p^2 - 25p + 20$, we get

$$5p^2 - 25p + 20 = 5(p^2 - 5p + 4)$$

Step 2: Factorise $p^2 - 5p + 4$

$$p^2 - 5p + 4 = p^2 - p - 4p + 4 = (p-1)(p-4)$$

Step 3: Solve original equation

$$(5p^2 - 25p + 20) \div (p-1) = 5(p-1)(p-4)/(p-1) = 5(p-4)$$

(iv) $4yz(z^2 + 6z - 16) \div 2y(z+8)$

Factorising $z^2 + 6z - 16$,

$$z^2 + 6z - 16 = z^2 - 2z + 8z - 16 = (z-2)(z+8)$$

$$\text{Now, } 4yz(z^2 + 6z - 16) \div 2y(z+8) = 4yz(z-2)(z+8)/2y(z+8) = 2z(z-2)$$

(v) $5pq(p^2 - q^2) \div 2p(p+q)$

$p^2 - q^2$ can be written as $(p-q)(p+q)$ using the identity.

$$5pq(p^2 - q^2) \div 2p(p+q) = 5pq(p-q)(p+q)/2p(p+q) = 5q(p-q)/2$$

(vi) $12xy(9x^2 - 16y^2) \div 4xy(3x+4y)$

Factorising $9x^2 - 16y^2$, we have

$$9x^2 - 16y^2 = (3x)^2 - (4y)^2 = (3x+4y)(3x-4y) \text{ using the identity } p^2 - q^2 = (p-q)(p+q)$$

$$\text{Now, } 12xy(9x^2 - 16y^2) \div 4xy(3x+4y) = 12xy(3x+4y)(3x-4y) / 4xy(3x+4y) = 3(3x-4y)$$

(vii) $39y^3(50y^2 - 98) \div 26y^2(5y+7)$

st solve for $50y^2 - 98$, we have

$$50y^2 - 98 = 2(25y^2 - 49) = 2((5y)^2 - 7^2) = 2(5y-7)(5y+7)$$

$$\text{Now, } 39y^3(50y^2 - 98) \div 26y^2(5y+7) =$$

$$\frac{3 \times 13 \times y^3 \times 2(5y-7)(5y+7)}{2 \times 13 \times y^2(5y+7)} = 3y(5y-7)$$

