

Similarly, in dividing a polynomial by a monomial, each term of the polynomial must be divided by the monomial. This statement is but an extension of the distributive axiom and is included in axiom D on page 187. The distributive axiom is applicable in such a situation because division by a number is equivalent to multiplication by the reciprocal of the number. For example, division by 3 is equivalent to multiplication by $\frac{1}{3}$.

$$\text{Example 1. } (8a - 4b + 12c) \div 4 = (8a - 4b + 12c)\left(\frac{1}{4}\right) \\ = 2a - b + 3c$$

In words, we may say: An indicated sum or difference is divided by a number if each of its terms is divided by that number. (See page 53.)

$$\text{Example 2. } \frac{x^4 + x^3 - 5x^2}{x^2} = x^2 + x - 5$$

$$\text{Example 3. } \frac{2a^3b + 6a^2b^2 + 8ab^3}{2ab} = a^2 + 3ab + 4b^2$$

Exercises ^[A-1]

Multiply:

1. $x + 2y - z$ by 4
2. $p^2 - pq + 2q^2$ by $2q$
3. $3x^2 + 6x - 12$ by $\frac{1}{3}$
4. $ax^3 + 2ax - a^2$ by $\frac{1}{a}$

5. $k^2 + 3k - 4$ by k^3
6. $p^2 + 2p + 1$ by $2p^2$
7. $4m - 2my + 2my^2$ by $\frac{1}{2m}$
8. $s^2t^2 + 2st^3 + 3t^4$ by $-2s^2t$

Divide:

9. $3x + 6$ by 3
10. $4a - 4$ by 2
11. $2x + 3$ by $\frac{1}{3}$
12. $x - 2$ by $\frac{1}{2}$
13. $\frac{4x + 16}{4}$
14. $\frac{6a^2b + 2ab}{2ab}$
15. $30a + 15$ by 15

16. $5a^2 - a$ by a
17. $\frac{10a^2 - a}{a}$
18. $4p^3 - 8p^2$ by $4p$
19. $ax - bx - 3cx$ by $-x$
20. $32x^4 - 8x^3 + 16x^2$ by $8x^2$
21. $5x^3z - 15xz^3$ by $-5xz$
22. $x^4y^2 + 3x^3y^2 + x^2y^2$ by x^2y

$$23. -3a^4b^4 - 2a^3b^3 + a^2b^2 \text{ by } -ab$$

$$24. 36x^4y^2 - 12x^3y + 30x^2y^2 \text{ by } 3x^2y$$

$$25. \text{One factor of } 9R^2 + 9r^2 \text{ is } 9. \text{ What is the other factor?}$$

Simplify:

26. $4x(x^2 - 2)$

27. $y^2(y^2 + 3y - 1)$

28. $6b^3(2 - 3b)$

29. $\frac{3x^2 - x}{-x}$

30. $\frac{6x^6 - 3x^3}{-3x^2}$

31. $\frac{27\pi h + 45\pi - 9\pi d}{9\pi}$

32. $\frac{-18x^3y^2 - 6x^2y^3 + 24x^2y^4}{-6x^2y^2}$

33. $5x\left(x + \frac{1}{5x}\right)$

34. $14y\left(\frac{y}{2} - 1 + \frac{1}{7y}\right)$

35. $-6a^2\left(\frac{a^2}{2} + \frac{1}{3} - \frac{2}{a^2}\right)$

36. $5y - y(y + 3)$

37. $x(2x - 3) + 3(x - 2)$

38. $3z(3z - 2) - 2(3z - 1)$

39. $6x(x - 2) - (x - 5)$

40. $5z^2 - 3(z + 4) - z(3z - 2)$

Solve the following equations:

41. $y(2y + 5) = 2y(y + 3) + 3$

42. $z(z - 2) = z(z + 4)$

43. $x(4 - 3x) + 3(x^2 - 12) = 0$

44. $2x(x - 2) - 5(x + 1) = 2x^2$

Exercises [A-2]

Multiply:

1. $a^2 + 4a$ by a

2. $5x^3 - 6x^2$ by $3x$

3. $2x^3 - 6x^2 + 4$ by $\frac{1}{2}$

4. $my^2 + 2my - m^2$ by $\frac{1}{m}$

5. $2x^2 - xy - y^2$ by $-2y$

6. $a^3 - a^2b + 3ab^2$ by ab^2

7. $16x^3 - 2x^2 - 14x$ by $\frac{1}{2x}$

8. $5a^3 - 7ab^2 + 6b^3$ by $-3ab$

Divide:

9. $6x + 3$ by 3

10. $16x - 8$ by -4

11. $2x + 13$ by $\frac{1}{2}$

12. $5 - 2x$ by $\frac{1}{3}$

13. $\frac{5x - 10}{5}$

14. $\frac{9ab^2 + 3ab}{3ab}$

15. $12x + 18y$ by 6

16. $\frac{3x^2 - 18x}{3x}$

17. $12x + 18y$ by 6

18. $8a^2 + 5ab$ by a

19. $16n^2 + 32n$ by $-16n$

20. $3a^3 - 9a^2 + 3a$ by $3a$

21. $x^6 - 5x^4 - x^3$ by x^2

22. $3p^4 - 21p^2q^2$ by $-3p^2$

23. $6a^3c - 24a^3c^3$ by $6a^3c$

24. $a^4 + a^3 - a^2$ by $-a^2$

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| <u>1.</u> $4x + 8y - 4z$ | <u>23.</u> $3a^3b^3 + 2a^2b^3 - ab$ |
| <u>2.</u> $2p^2q - 2pq^2 + 4q^3$ | <u>24.</u> $12x^2y - 4x + 10y$ |
| <u>3.</u> $x^2 + 2x - 4$ | <u>25.</u> $R^2 + r^2$ |
| <u>4.</u> $x^3 + 2x - a$ | <u>26.</u> $4x^3 - 8x$ |
| <u>5.</u> $k^5 + 3k^4 - 4k^3$ | <u>27.</u> $y^4 + 3y^3 - y^2$ |
| <u>6.</u> $2p^4 + 4p^3 + 2p^2$ | <u>28.</u> $12b^3 - 18b^4$ |
| <u>7.</u> $2 - y + y^2$ | <u>29.</u> $-3x + 1$ |
| <u>8.</u> $-2s^4t^3 - 4s^3t^4 - 6s^2t^5$ | <u>30.</u> $-2x^4 + x$ |
| <u>9.</u> $x + 2$ | <u>31.</u> $3h + 5 - d$ |
| <u>10.</u> $2a - 2$ | <u>32.</u> $3x + y - 4y^2$ |
| <u>11.</u> $6x + 9$ | <u>33.</u> $5x^2 + 1$ |
| <u>12.</u> $2x - 4$ | <u>34.</u> $7y^2 - 14y + 2$ |
| <u>13.</u> $x + 4$ | <u>35.</u> $-3a^4 - 2a^3 + 12$ |
| <u>14.</u> $3a + 1$ | <u>36.</u> $2y - y^2$ |
| <u>15.</u> $2a + 1$ | <u>37.</u> $2x^2 - 6$ |
| <u>16.</u> $5a - 1$ | <u>38.</u> $9z^2 - 12z + 2$ |
| <u>17.</u> $10a - 1$ | <u>39.</u> $6x^2 - 13x + 5$ |
| <u>18.</u> $p^2 - 2p$ | <u>40.</u> $2z^2 - z - 12$ |
| <u>19.</u> $-a + b + 3c$ | <u>41.</u> $y = -3$ |
| <u>20.</u> $4x^2 - x + 2$ | <u>42.</u> $z = 0$ |
| <u>21.</u> $-x^2 + 3z^2$ | <u>43.</u> $x = 9$ |
| <u>22.</u> $x^2y + 3xy + y$ | <u>44.</u> $x = \frac{-5}{9}$ |

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| <u>1.</u> $a^3 + 4a^2$ | <u>9.</u> $2x + 1$ |
| <u>2.</u> $15x^4 - 18x^3$ | <u>10.</u> $-4x + 2$ |
| <u>3.</u> $x^3 - 3x^2 + 2$ | <u>11.</u> $4x + 26$ |
| <u>4.</u> $y^2 + 2y - m$ | <u>12.</u> $15 - 6x$ |
| <u>5.</u> $-4x^2y + 2xy^2 + 2y^3$ | <u>13.</u> $x - 2$ |
| <u>6.</u> $a^4b^2 - a^3b^3 + 3a^2b^4$ | <u>14.</u> $3b + 1$ |
| <u>7.</u> $8x^2 - x - 7$ | <u>15.</u> $2x + 3y$ |
| <u>8.</u> $-15a^4b + 21a^2b^3 - 18ab^4$ | <u>16.</u> $x - 6$ |