Arithmetic in the Hindu-Arabic System

Contemporary Math (MAT-130)

Write each number in expanded form.

1. 87
2. 204
3. 37856
4. 9473
5. 184672
6. Thirty-four
7. One million, three hundred forty-five thousand, seven
8. Six hundred eleven
9. Thirteen thousand, nine hundred seventy-eight
10. Four hundred thirty thousand, five hundred seventeen

Simplify each expansion.

11. $(6 * 10^3) + (2 * 10^2) + (6 * 10^1) + (8 * 10^0)$
12. $(3 * 10^1) + (7 * 10^0)$
13. $(1 * 10^5) + (4 * 10^4) + (9 * 10^1)$
14. $(6 * 10^4) + (3 * 10^2) + (4 * 10^0)$
15. $(7 * 10^6) + (5 * 10^5) + (9 * 10^3) + (2 * 10^1) + (3 * 10^0)$

In the following, do each addition or subtraction in expanded notation.

16. $52 - 11$
17. $34 + 62$
18. $63 - 48$
19. $38 + 53$
20. $89 + 13$

Use the lattice method to find each product.

21. $56 * 21$
22. $123 * 45$
23. $37 * 561$
24. $306 * 836$

Use Napier's rods to find each product.

25. $6 * 84$
26. $26 * 785$
27. $362 * 147$
28. $141 * 1359$

Use the nine's complement method to perform each subtraction.

29. $685 - 493$
30. $653 - 93$
31. $3672 - 597$
32. $86245 - 63575$

Use the Russian peasant method to find each product.

33. $6 * 27$
34. $32 * 59$
35. $49 * 23$
36. $321 * 45$

Solutions:

1. $(8 * 10^1) + (7 * 10^0)$
2. $(2 * 10^2) + (0 * 10^1) + (4 * 10^0)$
3. $(3 * 10^4) + (7 * 10^3) + (8 * 10^2) + (5 * 10^1) + (6 * 10^0)$
4. $(9 * 10^3) + (4 * 10^2) + (7 * 10^1) + (3 * 10^0)$
5. $(1 * 10^5) + (8 * 10^4) + (4 * 10^3) + (6 * 10^2) + (7 * 10^1) + (2 * 10^0)$
6. $(3 * 10^1) + (4 * 10^0)$
7. $(1 * 10^6) + (3 * 10^5) + (4 * 10^4) + (5 * 10^3) + (0 * 10^2) + (0 * 10^1) + (7 * 10^0)$
8. $(6 * 10^2) + (1 * 10^1) + (1 * 10^0)$
9. $(1 * 10^4) + (3 * 10^3) + (9 * 10^2) + (7 * 10^1) + (8 * 10^0)$
10. $(4 * 10^5) + (3 * 10^4) + (0 * 10^3) + (5 * 10^2) + (1 * 10^1) + (7 * 10^0)$
11. 6268
12. 37
13. 140090
14. 60304
15. 7509023
16. $52 = (5 * 10^1) + (2 * 10^0)$
    $\underline{-11 = (1 * 10^1) + (1 * 10^0)}$
    $(4 * 10^1) + (1 * 10^0) = \boxed{41}$

17. $34 = (3 * 10^1) + (4 * 10^0)$
    $\underline{+62 = (6 * 10^1) + (2 * 10^0)}$
    $(9 * 10^1) + (6 * 10^0) = \boxed{96}$

18. $63 = (6 * 10^1) + (3 * 10^0) = (5 * 10^1) + (13 * 10^0)$
    $\underline{-48 = (4 * 10^1) + (8 * 10^0) = (4 * 10^1) + (8 * 10^0)}$
    $(1 * 10^1) + (5 * 10^0) = \boxed{15}$

19. $38 = (3 * 10^1) + (8 * 10^0)$
    $\underline{+53 = (5 * 10^1) + (3 * 10^0)}$
    $(8 * 10^1) + (11 * 10^0) = (9 * 10^1) + (1 * 10^0) = \boxed{91}$
20. $89 = (8 * 10^1) + (9 * 10^0)$
    $\underline{+13 = (1 * 10^1) + (3 * 10^0)}$
    $(9 * 10^1) + (12 * 10^0) = (10 * 10^1) + (2 * 10^0) = (1 * 10^2) + (0 * 10^1) + (2 * 10^0)$
    $= \boxed{102}$

21.

		2	1	
1	1 / 0	0 / 5		5
1	1 / 2	0 / 6		6
	7	6		

$= \boxed{1176}$

22.

		4	5	
0	0 / 4	0 / 5		1
5	0 / 8	1 / 0		2
5	1 / 2	1 / 5		3
	3	5		

$= \boxed{5535}$

23.

		5	6	1	
2	1 / 5	1 / 8	0 / 3		3
0	3 / 5	4 / 2	0 / 7		7
	7	5	7		

$= \boxed{20757}$

24.

		8	3	6	
2	2 / 4	0 / 9	1 / 8		3
5	0 / 0	0 / 0	0 / 0		0
5	4 / 8	1 / 8	3 / 6		6
	8	1	6		

$= \boxed{255816}$

25.

	8	4	
5	0	4	6
5	0	4	

$= \boxed{504}$

26.

		7	8	5	
	4	7	1	0	6
1	5	7	0		2
2	0	4	1	0	

$= \boxed{20410}$

27.

		3	6	2	
	2	5	3	4	7
1	4	4	8		4
3	6	2			1
5	3	2	1	4	

$= \boxed{53214}$

28.

		1	3	5	9	
		1	3	5	9	1
	5	4	3	6		4
1	3	5	9			1
1	9	1	6	1	9	

$= \boxed{191619}$

29.
$$\begin{array}{rrr} 685 & 685 & 191 \\ \underline{-493} & \underline{+506} & \underline{+1} \\ & 1191 & \boxed{192} \end{array}$$

30.
$$\begin{array}{rrrr} 653 & 653 & 653 & 559 \\ \underline{-93} & \underline{-093} & \underline{+906} & \underline{+1} \\ & & 1559 & \boxed{560} \end{array}$$

31.
$$\begin{array}{rrrr} 3672 & 3672 & 3672 & 3074 \\ \underline{-597} & \underline{-0597} & \underline{+9402} & \underline{+1} \\ & & 13074 & \boxed{3075} \end{array}$$

32.
$$\begin{array}{rrr} 86245 & 86245 & 22669 \\ \underline{-63575} & \underline{+36424} & \underline{+1} \\ & 122669 & \boxed{22670} \end{array}$$

33.
$$\begin{vmatrix} 6 & 27 \\ 3 & 54 \\ 1 & 108 \end{vmatrix}$$
$54 + 108 = \boxed{162}$

34.
$$\begin{vmatrix} 32 & 59 \\ 16 & 118 \\ 8 & 236 \\ 4 & 472 \\ 2 & 944 \\ 1 & 1888 \end{vmatrix}$$
$\boxed{1888}$

35.
$$\begin{vmatrix} 23 & 49 \\ 11 & 98 \\ 5 & 196 \\ 2 & 392 \\ 1 & 784 \end{vmatrix}$$
$49 + 98 + 196 + 784 = \boxed{1127}$

36.
$$\begin{vmatrix} 45 & 321 \\ 22 & 642 \\ 11 & 1284 \\ 5 & 2568 \\ 2 & 5136 \\ 1 & 10272 \end{vmatrix} \quad 321 + 1284 + 2568 + 10272 = \boxed{14445}$$