Math 303

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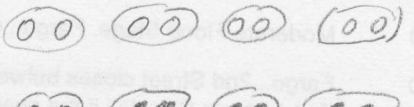
#1. $3(-1) = -3$

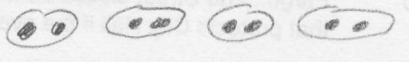
$2(-1) = -2$

$1(-1) = -1$

$0(-1) = 0$

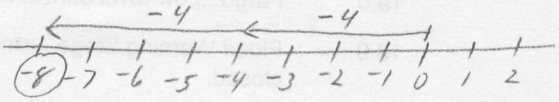
$(-1)(-1) = 1$

#2.  $4(-2) = -8$

 $-4(-2) = 8$

opposite of 4 groups of -2.

#3. $2(-4) = -8$



#5. (a) $4(-20) = -80$ The number of students eating in the cafeteria will decrease by 80 over the next four years.

(b) $(-4)(-20) = 80$ Four years ago, 80 more students ate in the cafeteria.

(c) $(n)(-20) = -20n$

(d) $(-n)(-20) = 20n$

#6. (a) $(-40) \div (-8) = 5$ (b) $(-143) \div 13 = -11$ (c) $-5 \div 0 = \square$ iff $0 \cdot \square = -5$. undefined

#7. (a) $((-10) \div (-2))(-2) = 5(-2) = -10$

(b) $(-10 \cdot 5) \div 5 = -50 \div 5 = -10$

(c) $-8 \div [(-8) + 8] = -8 \div 0$ undefined

(d) $(-6 + 6) \div (-2 + 2) = 0 \div 0$ undefined

(e) $|-24| \div [4(9 - 15)] = 24 \div [4(-6)] = 24 \div (-24) = -1$

#8. (a) $(-6)(5) = -30$

$(-30) \div 5 = -6$

$(-30) \div (-6) = 5$

(b) $(-5)(-4) = 20$

$20 \div (-5) = -4$

$20 \div (-4) = -5$

(c) $(-3)(0) = 0$

$0 \div (-3) = 0$

The other is undefined.

(d) $0 \cdot 0 = 0$

Both division problems are undefined.

#9. (a) $(4x) \div 4 = x$ iff $(4)(x) = 4x$

(b) $(-xy) \div y = -x$ iff $(-x)(y) = -xy$

#10. (a) $32 - 3(30) = 32 - 90 = -58$ The temperature at 8:30 p.m. is 58°C below zero.

(b) $0 - 4(-25) = 100$ The temperature at 7:55 p.m. was 100°C.

(c) $-20 - 4(-30) = -20 + 120 = 100$ The temperature at 7:30 p.m. was 100°C.

(d) $25 + 3(-20) = 25 - 60 = -35$ The temperature at 7:40 p.m. was 35°C below zero.

#11. $9(-12{,}000) = -108{,}000$ Over the next 9 years, it is predicted that 108,000 of farmland acreage will be lost to family dwellings.

#12. (a) $-1[(-5) + (-2)] = -1(-7) = 7$

$(-1)(-5) + (-1)(-2) = 5 + 2 = 7$

(b) $-3[(-3) + 2] = -3(-1) = 3$

$-3(-3) + (-3)(2) = 9 - 6 = 3$

#13. (a) $(-2)^3 = -8$ (b) $(-2)^4 = 16$ (c) $(-10)^5 \div (-10)^2 = (-10)^3 = -1000$

(d) $(-3)^5 \div (-3) = (-3)^4 = 81$ (e) $(-1)^{50} = 1$ (f) $(-1)^{151} = -1$

(g) $-2 + 3 \cdot 5 - 1 = -2 + 15 - 1 = 12$ (h) $10 - 3 \cdot 7 - 4(-2) + 3 = 10 - 21 + 8 + 3 = 0$

#14. (a) $(-2)^{64} - 2^{64} = 2^{64} - 2^{64} = 0$ (b) $-2^8 + 2^8 = 0$

(c) $-(-2)^5 + 0.9 - |7 - 15| - 15$

$= -(-32) + 0 - |-8| - 15$

$= 32 + 8 - 15$

$= 9$

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#15. (a) $-x^2$ negative (b) x^2 positive (c) $(-x)^2 = x^2$ positive (d) $-x^3$ neither (e) $(-x)^3 = -x^3$ neither

#17. (a) Commutative Property of Integer Multiplication

(b) Closure Property of Integer Multiplication

(c) Associative Property of Integer Multiplication

(d) Distributive Property of Multiplication over Addition of Integers.

#18. (a) $(-x)(-y) = xy$ (b) $-2x(-y) = 2xy$

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

(d) $-1 \cdot x = -x$

#19. (a) $-2(x-y) = -2x + 2y$ (b) $x(x-y) = x^2 - xy$

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

#20. (a) $-3x = 6$
$x = -2$

(b) $-3x = -6$
$x = 2$

(c) $-2x = 0$
$x = 0$

(d) $5x = -30$
$x = -6$

(e) $x \div 3 = -12$
$x = -36$

(f) $x \div (-3) = -2$
$x = 6$

(g) $x \div (-x) = -1$
All integers except 0

(h) $0 \div x = 0$
All integers except 0

#21. (a) $-3x - 8 = 7$
$-3x = 15$
$x = -5$

(b) $-2(5x-3) = 26$
$5x - 3 = -13$
$5x = -10$
$x = -2$

(c) $3x - x - 2x = 3$
$0 = 3$
no solution

(d) $-2(5x-6) - 30 = -x$
$-10x + 12 - 30 = -x$
$-18 = 9x$
$-2 = x$

(e) $x^2 = 4$
$x = 2$ or $x = -2$

(f) $(x-1)^2 = 9$
$x - 1 = -3$ or $x - 1 = 3$
$x = -2$ or $x = 4$

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#21. (g) $(x-1)^2 = (x+3)^2$

$x^2 - 2x + 1 = x^2 + 6x + 9$

$-8x = 8$

$x = -1$

(h) $(x-1)(x+3) = 0$

$x = 1$ or $x = -3$

#23. (a) $3x + 5x = (3+5)x$

$= 8x$

(b) $xy + x = x(y+1)$

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

(d) $3xy + 2x - xz = x(3y + 2 - z)$

(e) $abc + ab - a = a(bc + b - 1)$

(f) $16 - a^2 = (4+a)(4-a)$

(g) $4x^2 - 25y^2 = (2x - 5y)(2x + 5y)$

#25. (a) difference is 3

8, 11, 14, ...

(b) ratio is 2

$-128, -256, -512, \ldots$

(c) ratio is 2

$-2^7, -2^8, -2^9, \ldots$

#27. (a)

1	$1^2 - 10 = -9$
2	$2^2 - 10 = -6$
3	$3^2 - 10 = -1$
4	$4^2 - 10 = 6$
5	$5^2 - 10 = 15$

(b)

1	$-5(1) + 3 = -2$
2	$-5(2) + 3 = -7$
3	$-5(3) + 3 = -12$
4	$-5(4) + 3 = -17$
5	$-5(5) + 3 = -22$

(c)

1	$(-2)^1 - 1 = -3$
2	$(-2)^2 - 1 = 4 - 1 = 3$
3	$(-2)^3 - 1 = -8 - 1 = -9$
4	$(-2)^4 - 1 = 16 - 1 = 15$
5	$(-2)^5 - 1 = -32 - 1 = -33$

#29. $(-12 - 28) \div 5 = -40 \div 5 = -8$ The temperature in the first experiment is decreasing 8°C each minute.

$28 + (-8)x = -57 + (-3)x$ where x is the number of minutes since the experiment began.

$(-8)x - (-3)x = -57 - 28$

$-5x = -95$

$x = 17$

$28 + (-8)(17) = 28 - 136 = -108$

The temperatures of each experiment was 108°C below zero seventeen minutes after the experiments began.

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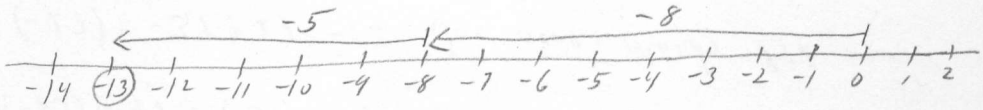
#15. (Answers will vary)

Sample answer.

The absolute value of a debt of $5 is greater than the absolute value of a debt of $2. $|-5| = 5 = 2 = |-2|$

But a debt of $2 is more valuable or better for a person than a debt of $5. $-2 > -5$ or $-5 < -2$.

#20. $(-8) + (-5) = -13$



#21. (a) 5 (b) −7 (c) 0

#22. (a) $|-14| = 14$ (b) $|-14| + 7 = 14 + 7 = 21$

(c) $8 - |-12| = 8 - 12 = -4$ (d) $|11| + |-11| = 11 + 11 = 22$

#23. $4(100) + 4 + (-3) + 5 + (-6)$

$= 400 + 0 = 400$

The total weight of the barrels was 400 pounds.

Worksheet – Multiplication

#1. (a) $(-7)(-8) = 56$

(b) $6(-4) = -24$

(c) $(-3)(9) = -27$

(d) $5(7) = 35$

(e) $(-548)(68) = -37,264$

$$\begin{array}{r} 548 \\ \times\ 68 \\ \hline 4384 \\ +32880 \\ \hline 37264 \end{array}$$

(f) $(-904)(-47) = 42,488$

$$\begin{array}{r} 904 \\ \times\ 47 \\ \hline 6328 \\ +36160 \\ \hline 42488 \end{array}$$

(g) $326(-305) = -99,430$

$$\begin{array}{r} 326 \\ \times 305 \\ \hline 1630 \\ +97800 \\ \hline 99430 \end{array}$$

(h) $525 - (-438) + (-291)$

$= 525 + 438 + (-291)$

$= 963 - 291$

$= 672$

(i) $(-9)(-5)(-4) = -180$

(j) $[32 + (-15) - 62] \div [(-13) - (-8)]$

$= (-45) \div (-5)$

$= 9$

(k) $(-72) \div (-6) = 12$

(l) $15 \div (-3) = -5$

(m) $(-54) \div 9 = -6$

(n) $63 \div 7 = 9$

(o) $(-1722) \div 7 = -246$

$$\begin{array}{r} 246 \\ 7\overline{)1722} \\ -14 \\ \hline 32 \\ -28 \\ \hline 42 \\ -42 \\ \hline \end{array}$$

(p) $(-27474) \div (-38) = 723$

$$\begin{array}{r} 723 \\ 38\overline{)27474} \\ -266 \\ \hline 87 \\ -76 \\ \hline 114 \\ -114 \\ \hline \end{array}$$

(q) $7614(-47) = -357,858$

$$\begin{array}{r} 7614 \\ \times\ 47 \\ \hline 53298 \\ +304560 \\ \hline 357858 \end{array}$$

(r) $(-16)[-93 + 37] = (-16)(-56)$

$= 896$

$$\begin{array}{r} 56 \\ \times\ 16 \\ \hline 336 \\ +560 \\ \hline 896 \end{array}$$

(s) $82[(-36) - (-28)] = 82(-8)$

$= -656$

(t) $(-9)(7)(-3)(0)(-14)(-7)(4)(12)$

$= 0$

#2. $(-2)(-3) = 6$ The temperature was 6° warmer two days ago.

#3. $(-4)(5) = -20$ The temperature was 20° colder four days ago.

#4. $3(2) = 6$ The temperature will be 6° warmer in three days.

#5. $4(-7) = -28$ The temperature will be 28° colder in four days.

#6. $54 + (-3)(-5)$ The stock price was 69 three days ago.
$= 54 + 15 = 69$

#7. $3(-5) = -15$ Kim is 15 points in the hole.

#8. $-4(-6)(25) = 600$ Jimmy had $6 more four days ago.

#9. $3(-5) = -15$ The team lost 15 yards over the three plays.

#10. $6(-320) = -1920$ The weather balloon lost 1920 feet in altitude over the six hours.

#11. $85 + (-13)(-14)$ The storage tank held 267 gallons thirteen hours ago.
$= 85 + 182$
$= 267$

$$\begin{array}{r} 14 \\ \times\ 13 \\ \hline 42 \\ +140 \\ \hline 182 \end{array}$$