1A

1) $(-3)^2 = (-3)(-3) = 9$

2) $-3^2 = -9$

3) $(6)(-5) = -30$

4) $(-8)(-5) = 40$

5) $8 + 6 = 6 + 8$
$14 = 14$ true (commutative property)

6) $9 \times 5 = 5 \times 9$
$45 = 45$ true (commutative property)

7) $8 - 4 = 4 - 8$
$4 = -4$ false

8) $36 \div 4 = 4 \div 36$
$9 = 4/36$ or $1/9$ false

9) $(2 + 9) + 8 = 2 + (9 + 8)$
$11 + 8 = 2 + 17$
$19 = 19$ true (associative property)

10) $(4 \times 5) \times 6 = 4 \times (5 \times 6)$
$20 \times 6 = 4 \times 30$
$120 = 120$ true (associative property)

11) $(11 - 4) - 2 = 11 - (4 - 2)$
$7 - 2 = 11 - 2$
$5 = 9$ false

12) $(9 \div 3) \div 3 = 9 \div (3 \div 3)$
$3 \div 3 = 9 \div 1$
$1 = 9$ false

13) false; see #7

14) true; see #9

15) true; see #6 and # 10

1B

1) $(-3) + (-10) = -13$

2) $(-3) - (10) = -13$

3) $6 - (-5) = 6 + 5 = 11$

4) $(-8) - (-5) = (-8) + 5 = -3$

5) $5D - 6C + 8D - 3C + B =$
$B + (-6C - 3C) + (5D + 8D) =$
$(B) + (-9C) + (13D) = B - 9C + 13D$
(This could be correctly written in a different order, but putting unknowns in alphabetical order is customary.)

6) $2A + B - A + 3B = (2A - A) + (B + 3B) =$
$A + 4B$

7) $5Q + 3C - C + Q + 4Q - 5C =$
$(3C - C - 5C)(+ (5Q + Q + 4Q) =$
$-3C + 10Q$

8) $20 + 5X - 6Y + Y + 2X + X - 9 =$
$(20 - 9) + (5X + 2X + X) + (-6Y + Y) =$
$11 + 8X - 5Y$

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

10) $3Y - 1 + 2Y - 1 - 4Y =$
$(3Y + 2Y - 4Y) + (-1 - 1) = Y - 2$

11) $5A - 6B - 3B + 10A - 8 =$
$(5A + 10A) + (-6B - 3B) + (-8) =$
$15A - 9B - 8$

12) $18X - 5Y - 9X + Y =$
$(18X - 9X) + (-5Y + Y) = 9X - 4Y$

13) false; see solution for 1A #12

14) true; see solution for 1A #10

15) false; see solution for 1A #11

1C

1) $4Q + 2C - 2C - 2Q - 3C =$
$(2C - 2C - 3C) + (4Q - 2Q) = -3C + 2Q$

2) $-5M - 7 + 3M - 4 + 5 =$
$(-5M + 3M) + (-7 - 4 + 5) = -2M - 6$

3) $2A - 3B + 4C - A + B + C =$
$(2A - A) + (-3B + B) + (4C + C) = A - 2B + 5C$

4) $4A - 5 - 2A + 7 - 1 =$
$(4A - 2A) + (-5 + 7 - 1) = 2A + 1$

5) $4X - 3Y - 6Y + 10X - 5 =$
$(4X + 10X) + (-3Y - 6Y) - 5 = 14X - 9Y - 5$

6) $15X - 4Y - 6X + Y =$
$(15X - 6X) + (-4Y + Y) = 9X - 3Y$

7) $15X + 6X - 4Y - 5Y - 14X + 10 =$
$(15X + 6X - 14X) + (-4Y - 5Y) + 10 =$
$7X - 9Y + 10$

8) $3A - 4B + 6A + 7B + 8 =$
$(3A + 6A) + (-4B + 7B) + 8 = 9A + 3B + 8$

9) $(-3)(5) = -15$

10) $(-81) \div (-9) = 9$

11) $4 \div (-2) = -2$

12) $(-5)^2 = (-5)(-5) = 25$

13) $4 + (-2) = 2$

14) $-4^2 = -(4)(4) = -16$

15) $\frac{1}{\cancel{4}_1} \times \frac{\cancel{7}^1}{11} \times \frac{\cancel{4}^1}{\cancel{7}_1} = \frac{1}{11}$

16) $\frac{1}{2} \times \frac{5}{6} \times \frac{11}{12} = \frac{55}{144}$

17) $\frac{1}{3} \div \frac{4}{5} = \frac{5}{15} \div \frac{12}{15} = \frac{5}{12}$

18) $\frac{15}{2} \div \frac{18}{7} = \frac{105}{14} \div \frac{36}{14} = \frac{105}{36} = 2\frac{11}{12}$

19) $\frac{1}{3} \div \frac{4}{5} = \frac{1}{3} \times \frac{5}{4} = \frac{5}{12}$
(note answer for #17)

20) $\frac{15}{2} \div \frac{18}{7} = \frac{\cancel{15}^5}{2} \times \frac{7}{\cancel{18}_6} = \frac{35}{12} = 2\frac{11}{12}$ (note answer for #18)

1D

1) $2A - 3B + 4A + 4B - 5A =$
$(2A + 4A - 5A) + (-3B + 4B) = A + B$

2) $18X + 5X - 6Y - 8Y - 11X + 10Y =$
$(18X + 5X - 11X) + (-6Y - 8Y + 10Y) =$
$12X - 4Y$

3) $4A - 4B + 16A + 7B + 18 =$
$(4A + 16A) + (-4B + 7B) + 18 =$
$20A + 3B + 18$

4) $-5X + 3 + 8X - 4 =$
$(-5X + 8X) + (3 - 4) = 3X - 1$

5) $8K - 6 + 3K - 2K + 3 =$
$(8K + 3K - 2K) + (-6 + 3) = 9K - 3$

6) $10C - 3C - 9D + 3D - C =$
$(10C - 3C - C) + (-9D + 3D) = 6C - 6D$

7) $13A - 8Z - 2A - 12Z =$
$(13A - 2A) + (-8Z - 12Z) = 11A - 20Z$

8) $7D - 4D - 4 + 5D + 8 - 7D =$
$(7D - 4D + 5D - 7D) + (-4 + 8) = D + 4$

9) $(-3)^2 = (-3)(-3) = 9$

10) $-3^3 = -(3)(3)(3) = -27$

11) $(-6)(-2) = +12$

12) $(-4) - (-3) = (-4) + (+3) = -1$

13) $\frac{\cancel{4}^{1}}{\cancel{8}_{1}} \times \frac{1}{2} \times \frac{\cancel{5}^{1}}{\cancel{8}_{2}} = \frac{1}{4}$

14) $\frac{1}{\cancel{2}_{1}} \times \frac{\cancel{6}^{1}}{7} \times \frac{2}{\cancel{3}_{1}} = \frac{2}{7}$

15) $\frac{5}{8} \div \frac{1}{7} = \frac{35}{56} \div \frac{8}{56} = \frac{35}{8} = 4\frac{3}{8}$

16) $\frac{5}{8} \div \frac{1}{7} = \frac{5}{8} \times \frac{7}{1} = \frac{35}{8} = 4\frac{3}{8}$

17) 28 → 2, 14 → 2, 7 — $2 \times 2 \times 7$

18) 42 → 2, 21 → 3, 7 — $2 \times 3 \times 7$

19) 48 → 2, 24 → 2, 12 → 2, 6 → 2, 3 — $2 \times 2 \times 2 \times 2 \times 3$

20) 100 → 2, 50 → 2, 25 → 5, 5 — $2 \times 2 \times 5 \times 5$

Rules for divisibility.

Number is divisible by	if
2	ends in even number
3	digits add to multiple of 3
9	digits add to multiple of 9
5	ends in 5 or 0

1E

1) $(1 + 4) + 9 \bigcirc 1 + (4 + 9)$
$14 \textcircled{=} 14$

2) yes

3) $9 \div 3 \bigcirc 81 \div 9$
$3 \textcircled{\neq} 27$

4) no

5) $12 \times 3 \bigcirc 12 \times 3$
$36 \textcircled{=} 36$

6) yes

7) $110 - 4 \bigcirc 11 - 125$
$106 \textcircled{\neq} -114$

8) no

9) $\frac{1}{4} \times \frac{\cancel{3}^{1}}{\cancel{5}_{1}} \times \frac{\cancel{5}^{1}}{\cancel{3}_{1}} = \frac{1}{4}$

10) $\frac{\cancel{11}^{1}}{\cancel{6}_{2_{1}}} \times \frac{\cancel{3}^{1}}{\cancel{11}_{1}} \times \frac{\cancel{4}^{2}}{7} = \frac{2}{7}$

11) $\frac{7}{4} \div \frac{7}{8} = \frac{56}{32} \div \frac{28}{32} = \frac{56}{28} = 2$

12) $\frac{7}{4} \div \frac{7}{8} = \frac{\cancel{7}^{1}}{\cancel{4}_{1}} \times \frac{\cancel{8}^{2}}{\cancel{7}_{1}} = 2$

13) 16 → 2, 8 → 2, 4 → 2, 2 — $2 \times 2 \times 2 \times 2$

14) 54 → 2, 27 → 3, 9 → 3, 3 — $2 \times 3 \times 3 \times 3$

15) 72 → 2, 36 → 2, 18 → 2, 9 → 3, 3 — $2 \times 2 \times 2 \times 3 \times 3$

16) 36 → 2, 18 → 2, 9 → 3, 3 — $2 \times 2 \times 3 \times 3$

17) $\frac{24}{36} = \frac{2 \times \cancel{12}}{3 \times \cancel{12}} = \frac{2}{3}$ 12 is GCF

18) $\frac{10}{25} = \frac{2 \times \cancel{5}}{5 \times \cancel{5}} = \frac{2}{5}$ 5 is GCF

19) $\frac{30}{45} = \frac{2 \times \cancel{15}}{3 \times \cancel{15}} = \frac{2}{3}$ 15 is GCF

20) $\frac{32}{56} = \frac{4 \times \cancel{8}}{7 \times \cancel{8}} = \frac{4}{7}$ 8 is GCF