# Algebra 2 Placement Test
# Answer Key

1. $(X^7 \div X^3) + (X^2 \cdot X^2) = (X^{7-3}) + (X^{2+2}) =$
   $X^4 + X^4 = 2X^4$

2. $\dfrac{A^5 B^{-3}}{B^3 A^2} = A^5 B^{-3} A^{-2} B^{-3} =$
   $A^{5+(-2)} B^{-3+(-3)} = A^3 B^{-6}$ or $\dfrac{A^3}{B^6}$

3. $\left(\dfrac{8}{27}\right)^{-\frac{1}{3}} = \left(\dfrac{27}{8}\right)^{\frac{1}{3}} = \dfrac{27^{\frac{1}{3}}}{8^{\frac{1}{3}}} = \dfrac{3}{2}$ or $1\dfrac{1}{2}$

4. $2\sqrt{5} + 7\sqrt{5} = (2+7)\sqrt{5} = 9\sqrt{5}$

5. $\dfrac{X}{3+i} = \dfrac{X(3-i)}{(3+i)(3-i)} = \dfrac{3X - Xi}{9 - i^2} =$
   $\dfrac{3X - Xi}{9 - (-1)} = \dfrac{3X - Xi}{10}$ or $\dfrac{X(3-i)}{10}$

6. $\dfrac{3}{1+\sqrt{3}} = \dfrac{3(1-\sqrt{3})}{(1+\sqrt{3})(1-\sqrt{3})}$
   $= \dfrac{3 - 3\sqrt{3}}{1-3} = \dfrac{3 - 3\sqrt{3}}{-2}$

7. $\dfrac{5}{6X} + \dfrac{4}{3Y} = \dfrac{5(Y)}{6X(Y)} + \dfrac{4(2X)}{3Y(2X)} = \dfrac{5Y + 8X}{6XY}$

8. $5Q^{-1} R Q^2 + 3QR - R = 5Q^{-1+2} R + 3QR - R =$
   $5Q^1 R + 3QR - R = 5QR + 3QR - R = 8QR - R$

9. $(.0009)(.027) =$
   $(9.0 \times 10^{-4})(2.7 \times 10^{-2}) =$
   $(9.0 \times 2.7)(10^{-4} \times 10^{-2}) =$
   $24.3 \times 10^{-6} = 2.43 \times 10^{-5}$
   If significant digits are taken into account:
   $2.0 \times 10^{-5}$ (either answer is correct)

10. $\dfrac{3,700,000}{.002} = \dfrac{3.7 \times 10^6}{2.0 \times 10^{-3}} =$
    $(3.7 \times 10^6) \div (2.0 \times 10^{-3}) =$
    $(3.7 \div 2.0)(10^6 \div 10^{-3}) =$
    $1.85 \times 10^9$
    $2.0 \times 10^9$ with significant digits

11. $2X^2 - 9X = 35$
    $2X^2 - 9X - 35 = 0$
    $X = \dfrac{-(-9) \pm \sqrt{(-9)^2 - 4(2)(-35)}}{2(2)} =$
    $\dfrac{9 \pm \sqrt{81 - (-280)}}{4} = \dfrac{9 \pm \sqrt{361}}{4} = \dfrac{9 \pm 19}{4}$
    $X = \dfrac{9+19}{4} \qquad X = \dfrac{9-19}{4}$
    $X = \dfrac{28}{4} \qquad X = \dfrac{-10}{4}$
    $X = 7 \qquad X = -\dfrac{5}{2}$
    $\qquad\qquad X = -2\dfrac{1}{2}$

12. $X^2 + 4X - 4 = -3X$
    $X^2 + 7X - 4 = 0$
    $X = \dfrac{-(7) \pm \sqrt{(7)^2 - 4(1)(-4)}}{2(1)} =$
    $\dfrac{-7 \pm \sqrt{49 - (-16)}}{2} = \dfrac{-7 \pm \sqrt{65}}{2}$

13. sketch parabola and line
    (see graph on next page)
    $Y = X^2 + 2$
    $Y = X + 2 \Rightarrow (X^2 + 2) = X + 2$
    $\qquad\qquad\qquad X^2 - X = 0$
    $\qquad\qquad\qquad (X)(X - 1) = 0$
    $X = 0$
    $Y = X + 2 \Rightarrow Y = (0) + 2$
    $\qquad\qquad\qquad Y = 2$
    solution 1: $(0, 2)$
    $X - 1 = 0$
    $\quad X = 1$
    $Y = X + 2 \Rightarrow Y = (1) + 2$
    $\qquad\qquad\qquad Y = 3$
    solution 2: $(1, 3)$

$Y = X^2 + 2$

$Y = X + 2$
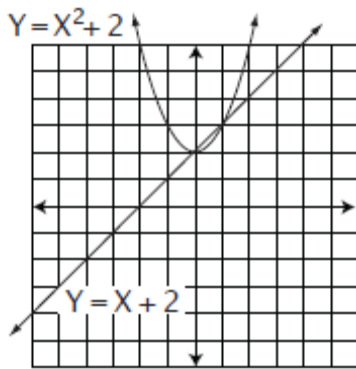
**14.** sketch circle and hyperbola

$$X^2 + Y^2 = 1$$
$$\underline{X^2 - Y^2 = 1}$$
$$2X^2 \qquad = 2$$
$$X^2 = 1$$
$$X = \pm 1$$

$X = 1$:

$$X^2 + Y^2 = 1 \Rightarrow (1)^2 + Y^2 = 1$$
$$1 + Y^2 = 1$$
$$Y^2 = 0$$
$$Y = 0$$

solution 1: $(1, 0)$

$X = -1$:

$$X^2 + Y^2 = 1 \Rightarrow (-1)^2 + Y^2 = 1$$
$$1 + Y^2 = 1$$
$$Y^2 = 0$$
$$Y = 0$$

solution 2: $(-1, 0)$



$X^2 + Y^2 = 1$

$X^2 - Y^2 = 1$
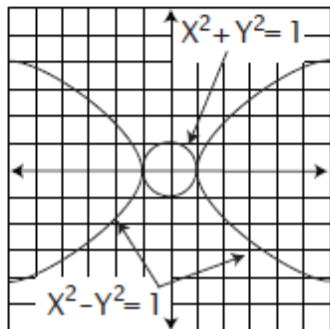
**15.** $15\% \times \$1,565 = .15 \times \$1,565 = \$234.75$ off
$\$1,565 - \$234.75 = \$1,330.25$

**16.** Weight of NaCl $= 23 + 35 = 58$

$$\frac{Na}{NaCl} = \frac{23}{58} \approx .40 = 40\%$$

**17.** $\dfrac{C}{D} = \dfrac{5}{18} \Rightarrow \dfrac{(10)}{D} = \dfrac{5}{18}$

$$10(18) = 5D$$
$$2(18) = D$$
$$D = 36 \text{ dogs}$$

**18.** $\dfrac{10 \text{ km}}{1} \times \dfrac{.62 \text{ mi}}{1 \text{ km}} = (10)(.62 \text{ mi}) = 6.2 \text{ mi}$

**19.** $D_M = R_M T_M \Rightarrow D_M = (55)(9)$
$$D_M = 495 \text{ mi}$$

$$D_A = R_A T_A$$

$(495) = (45) T_A \Rightarrow \begin{cases} D_A = D_M \\ R_A = 45 \end{cases}$

$T_A = 11$ hours; arrived at 7:00 PM

**20.**

$-10(D + Q = 15) \Rightarrow -10D - 10Q = -150$

$100(.10D + .25Q = 3.15) \Rightarrow \underline{10D + 25Q = \quad 315}$

$$15Q = \quad 165$$
$$Q = 11 \text{ quarters}$$

$D + Q = 15 \Rightarrow D + (11) = 15$
$$D = 4 \text{ dimes}$$

**21.** integers are N, N+2, and N+4

$3(N) + 2(N + 2) - (N + 4) = 16$

$3N + 2N + 4 - N - 4 = 16$

$4N = 16$

$N = 4$

*Note that in this line, the entire quantity $(N + 4)$ is subtracted. Think of it as distributing $-1$ across the two terms inside the parentheses.

Integers are 4, 6 and 8.

**22.** $M_T = 10\%$ mixture; $M_S = 60\%$ mixture

$$-10(M_T + M_S = 100) \Rightarrow \quad -10M_T - 10M_S = -1,000$$
$$100(.10M_T + .60M_S = .45(100)) \Rightarrow \quad \underline{10M_T + 60M_S = \quad 4,500}$$
$$50M_S = \quad 3,500$$
$$M_S = 70 \text{ lb}$$

$$M_T + M_S = 100 \Rightarrow M_T + (70) = 100$$
$$M_T = 30 \text{ lb}$$

**23.** $R + 6 = 2(A + 6)$

$R + 6 = 2A + 12$

$R = 2A + 6$

$(A - 4)(3) = R - 4$

$3A - 12 = R - 4$

$3A - 8 = R \Rightarrow 3A - 8 = (2A + 6)$

$\qquad\qquad\qquad\quad A = 14 \text{ years old}$

$R = 2A + 6 \Rightarrow R = 2(14) + 6$

$\qquad\qquad\qquad R = 28 + 6$

$\qquad\qquad\qquad R = 34 \text{ years old}$

**24.** $D_D = R_D T_D$

$D_D = (B + W) T_D$

$(26) = (B + (5))(T_D) \Rightarrow \begin{cases} D_D = 26 \\ W = 5 \end{cases}$

$T_D = \dfrac{26}{B + 5}$

$D_U = R_U T_U$

$D_U = (B - W) T_U$

$(6) = (B - (5))(T_U) \Rightarrow \begin{cases} D_U = 6 \\ W = 5 \end{cases}$

$T_U = \dfrac{6}{B - 5}$

$T_D = T_U \Rightarrow \qquad \dfrac{26}{B + 5} = \dfrac{6}{B - 5}$

$\qquad\qquad 26(B - 5) = 6(B + 5)$

$\qquad\qquad 26B - 130 = 6B + 30$

$\qquad\qquad\qquad 20B = 160$

$\qquad\qquad\qquad\quad B = 8 \text{ mph}$