**Using the Discriminant GREEN**

1. Calculate the value of the discriminant for each of the following functions.

a) f(x) = x² + 8x + 3

b) g(x) = 2x² - 3x + 4

c) h(x) = -x² + 7x – 3

d) j(x) = x² - 8x + 16

e) k(x) = 2x – 3x² - 4

2. What do your answers to question 1 tell you about the roots of each of the functions?

a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Find the values of k for which x² + 6x + k = 0 has two real solutions.

4. Find the value of t for which 2x² - 3x + t = 0 has exactly one solution.

5. Find the range of values of k for which 3x² - 4x + k = 0 has no real solutions.

6. Given that the function f(x) = sx² + 8x + s has equal roots, find the value of the positive constant s.

7. The function g(x) = x² + 3px + (14p – 3), where p is an integer, has two equal roots.

a) Find the value of p.

b) For this value of p, solve the equation x² + 3px + (14p – 3) = 0.

8. h(x) = 2x² + (k + 4)x + k, where k is a real constant.

a) Find the discriminant of h(x) in terms of k.

b) Hence or otherwise, prove that h(x) has two distinct real solutions for all values of k.

**Using the Discriminant AMBER**

b² - 4ac

1. Calculate the value of the discriminant for each of the following functions.

a) f(x) = x² + 8x + 3 🡪 8² - 4 x 1 x 3 =

b) g(x) = 2x² - 3x + 4

c) h(x) = -x² + 7x – 3

d) j(x) = x² - 8x + 16

e) k(x) = 2x – 3x² - 4

2. What do your answers to question 1 tell you about the roots of each of the functions?

**Hint**: are the answers positive or negative?

a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Find the values of k for which x² + 6x + k = 0 has two real solutions.

**Hint**: Two roots 🡪 b² - 4ac > 0

4. Find the value of t for which 2x² - 3x + t = 0 has exactly one solution.

**Hint**: One roots 🡪 b² - 4ac = 0

5. Find the range of values of k for which 3x² - 4x + k = 0 has no real solutions.

**Hint**: No roots 🡪 b² - 4ac < 0

6. Given that the function f(x) = sx² + 8x + s has equal roots, find the value of the positive constant s.

**Hint**: One roots 🡪 b² - 4ac = 0

7. The function g(x) = x² + 3px + (14p – 3), where p is an integer, has two equal roots.

a) Find the value of p.

**Hint**: Two roots 🡪 b² - 4ac > 0

b) For this value of p, solve the equation x² + 3px + (14p – 3) = 0.

8. h(x) = 2x² + (k + 4)x + k, where k is a real constant.

a) Find the discriminant of h(x) in terms of k.

b) Hence or otherwise, prove that h(x) has two distinct real solutions for all values of k.

**Using the Discriminant RED**

b² - 4ac

1. Calculate the value of the discriminant for each of the following functions.

a) f(x) = x² + 8x + 3 🡪 8² - 4 x 1 x 3 = 64 – 12 = 56

b) g(x) = 2x² - 3x + 4 🡪 (-3)² - 4 x 2 x 4 =

c) h(x) = -x² + 7x – 3

d) j(x) = x² - 8x + 16

e) k(x) = 2x – 3x² - 4

2. What do your answers to question 1 tell you about the roots of each of the functions?

**Hint**: are the answers positive or negative?

a) Positive discriminant means f(x) has two real roots\_\_\_\_\_\_\_\_\_\_\_\_

b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Find the values of k for which x² + 6x + k = 0 has two real solutions.

6² - 4 x 1 x k > o

**Hint**: Two roots 🡪 b² - 4ac > 0

36 – 4k > 0

**Hint**: Solve to find value of k

4. Find the value of t for which 2x² - 3x + t = 0 has exactly one solution.

**Hint**: One roots 🡪 b² - 4ac = 0

5. Find the range of values of k for which 3x² - 4x + k = 0 has no real solutions.

**Hint**: No roots 🡪 b² - 4ac < 0

6. Given that the function f(x) = sx² + 8x + s has equal roots, find the value of the **positive** constant s.

**Hint**: One roots 🡪 b² - 4ac = 0

8² - 4 x s x s = 0

64 – 4s² = 0

7. The function g(x) = x² + 3px + (14p – 3), where p is an **integer**, has two equal roots.

a) Find the value of p.

**Hint**: Two roots 🡪 b² - 4ac > 0

(3p)² - 4(14p – 3) > 0

b) For this value of p, solve the equation x² + 3px + (14p – 3) = 0.

8. h(x) = 2x² + (k + 4)x + k, where k is a real constant.

a) Find the discriminant of h(x) in terms of k.

a = 2, b = (k + 4), c = k

b) Hence or otherwise, prove that h(x) has two distinct real solutions for all values of k.