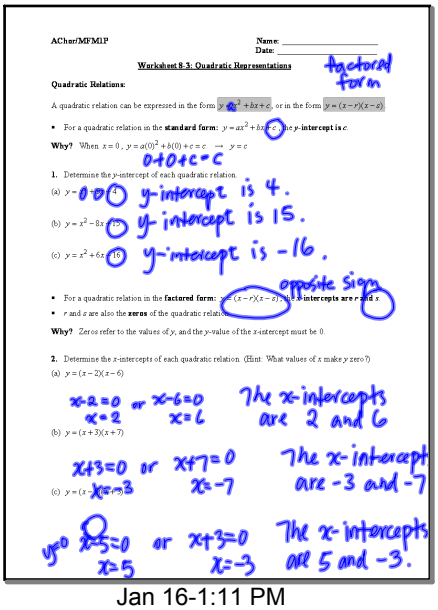

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Worksheet 8-3: Quadratic Representations

factored form

Quadratic Relations:

A quadratic relation can be expressed in the form $y = ax^2 + bx + c$, or in the form $y = (x - r)(x - s)$.

- For a quadratic relation in the **standard form**: $y = ax^2 + bx + c$, the **y-intercept is c**.

Why? When $x = 0$, $y = a(0)^2 + b(0) + c = c \rightarrow y = c$

0+0+c=c

1. Determine the y-intercept of each quadratic relation.

(a) $y = 0.5x^2 + 4$ y-intercept is 4.

(b) $y = x^2 - 8x + 15$ y-intercept is 15.

(c) $y = x^2 + 6x - 16$ y-intercept is -16.

- For a quadratic relation in the **factored form**: $y = (x - r)(x - s)$, the **x-intercepts are r and s**.
- r and s are also the **zeros** of the quadratic relation

opposite sign

Why? Zeros refer to the values of y, and the y-value of the x-intercept must be 0.

2. Determine the x-intercepts of each quadratic relation. (Hint: What values of x make y zero?)

(a) $y = (x - 2)(x - 6)$

$x-2=0$ or $x-6=0$ The x-intercepts are 2 and 6

$x=2$ $x=6$

(b) $y = (x + 3)(x + 7)$

$x+3=0$ or $x+7=0$ The x-intercepts are -3 and -7

$x=-3$ $x=-7$

(c) $y = (x - 5)(x + 3)$

$y=0$ $x-5=0$ or $x+3=0$ The x-intercepts are 5 and -3.

$x=5$ $x=-3$

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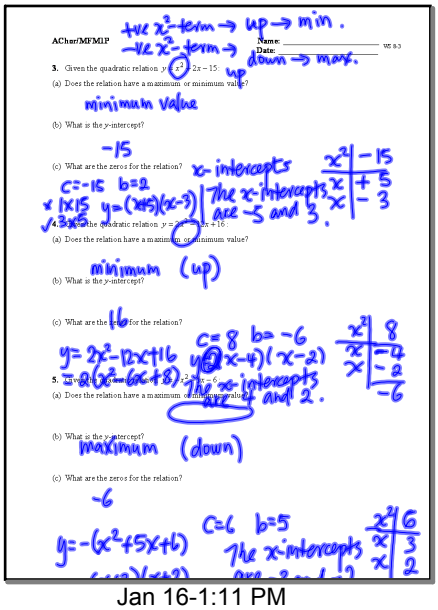

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+ve x^2-term → up → min.

-ve x^2-term → down → max.

3. Given the quadratic relation $y = x^2 - 2x - 15$:

(a) Does the relation have a maximum or minimum value?

up

minimum value

(b) What is the y-intercept?

-15

(c) What are the zeros for the relation?

x-intercepts

c=-15 b=2

x^2 | -15

x | +5

x | -3

$y=(x+5)(x-3)$ The x-intercepts are -5 and 3.

4. Given the quadratic relation $y = x^2 + 6x + 8$:

(a) Does the relation have a maximum or minimum value?

minimum (up)

(b) What is the y-intercept?

8

(c) What are the zeros for the relation?

c=8 b=-6

$y=2x^2-12x+16$ $y=2(x-4)(x-2)$

x^2 | 8

x | -4

x | -2

-6

5. Given the quadratic relation $y = -2(x^2 - 6x + 8)$:

(a) Does the relation have a maximum or minimum value?

x-intercepts 4 and 2.

(b) What is the y-intercept?

maximum (down)

(c) What are the zeros for the relation?

-6

$y=-(x^2+5x+6)$ c=6 b=5 The x-intercepts

x^2 | 6

x | 3

x | 2

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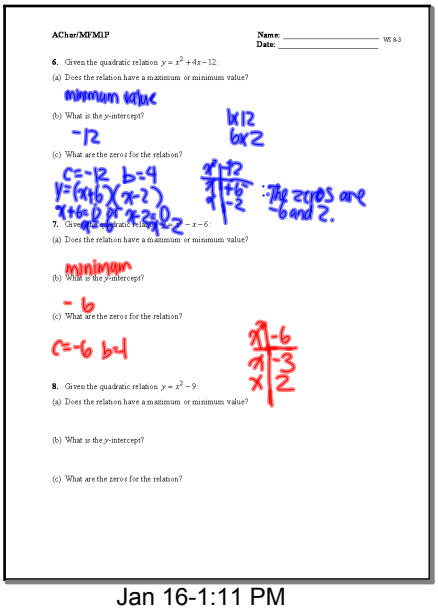

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6. Given the quadratic relation $y = x^2 + 4x - 12$:

(a) Does the relation have a maximum or minimum value?

minimum value

(b) What is the y-intercept?

-12

1x12

6x2

(c) What are the zeros for the relation?

c=-12 b=4

$y=(x+6)(x-2)$

$x+6=0$ or $x-2=0$

$x=-6$ $x=2$

x^2 | +12

+6 | +6

-2 | -2

∴ The zeros are -6 and 2.

7. Given the quadratic relation $y = x^2 - x - 6$:

(a) Does the relation have a maximum or minimum value?

minimum

(b) What is the y-intercept?

-6

(c) What are the zeros for the relation?

c=-6 b=1

x | -6

x | -3

x | 2

8. Given the quadratic relation $y = x^2 - 9$:

(a) Does the relation have a maximum or minimum value?

(b) What is the y-intercept?

(c) What are the zeros for the relation?

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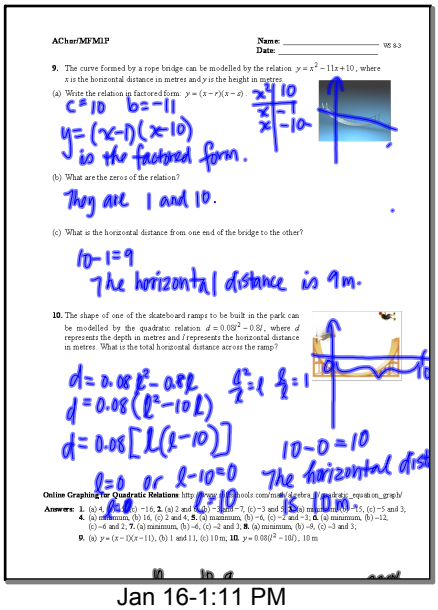

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9. The curve formed by a rope bridge can be modelled by the relation $y = x^2 - 11x + 10$, where x is the horizontal distance in metres and y is the height in metres.

(a) Write the relation in factored form: $y = (x - r)(x - s)$

c=10 b=-11

$y=(x-1)(x-10)$ is the factored form.

x^2 | 10

x | -1

x | -10

(b) What are the zeros of the relation?

They are 1 and 10.

(c) What is the horizontal distance from one end of the bridge to the other?

10-1=9 The horizontal distance is 9m.

10. The shape of one of the skateboard ramps to be built in the park can be modelled by the quadratic relation $d = 0.08l^2 - 0.8l$, where d represents the depth in metres and l represents the horizontal distance in metres. What is the total horizontal distance across the ramp?

$d=0.08l^2-0.8l$

$d=0.08(l^2-10l)$

$d=0.08[l(l-10)]$

$l=0$ or $l-10=0$

$\frac{l^2}{2}=1$ $\frac{l}{2}=1$

10-0=10 The horizontal dist

Online Graphing for Quadratic Relations: http://www.mathtools.com/math/algebra/quadratic_equation_graph/

Answers: **1.** (a) 4, (b) 15, (c) −16, **2.** (a) 2 and 6, (b) −3 and −7, (c) −3 and 5, **3.** (a) minimum, (b) −15, (c) −5 and 3, **4.** (a) minimum, (b) 16, (c) 2 and 4, **5.** (a) maximum, (b) −6, (c) −2 and −3, **6.** (a) minimum, (b) −12, (c) −6 and 2, **7.** (a) minimum, (b) −6, (c) −2 and 3, **8.** (a) minimum, (b) −9, (c) −3 and 3,

9. (a) $y = (x - 1)(x - 11)$, (b) 1 and 11, (c) 10 m, **10.** $y = 0.08(l^2 - 10l)$, 10 m

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