What's Going On?

Checking In

Minds on The Unit in a Nutshell

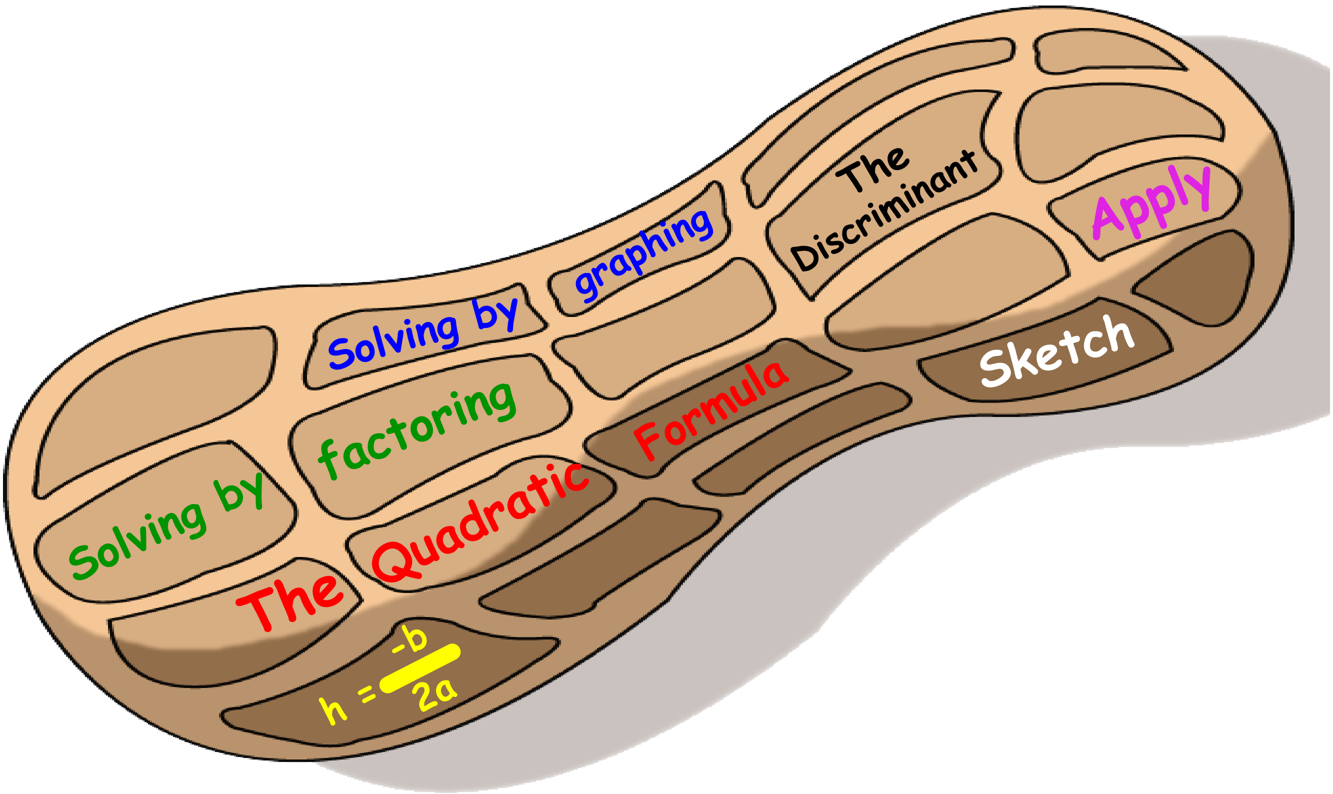
Action! Apply

Consolidation Find My Equation

Learning Goal - I will be ready for tomorrow's big test!

Minds on

The Unit In a Nut Shell



Action!

Apply

Pg. 295
Modelling Math

7. The function $h = -5t^2 + 20t + 1$ models the height, h metres, of a baseball as a function of the time, t seconds, since it was hit.
The ball hit the ground before a fielder could catch it.

a) How long was the baseball in the air?
b) For how many seconds was the height of the ball at least 16 m?

To answer this question, we need to find the time at which the ball lands on the ground.
When the ball is on the ground, $h = 0$!
Solve it using the quadratic formula ($a = -5$, $b = 20$, $c = 1$)

Action!

Apply

Pg. 295
Modelling Math

7. The function $h = -5t^2 + 20t + 1$ models the height, h metres, of a baseball as a function of the time, t seconds, since it was hit.
The ball hit the ground before a fielder could catch it.

b) For how many seconds was the height of the ball at least 16 m?

To answer this question, we need to find the times at which the ball is at 16 m. Then we can find how the difference between these times, that will be our answer!
To do this, first we substitute in 16 for h, (the height is 16 m)
Then, solve it by factoring!

Action!

Application Problems
The Set-Up

Not in book.

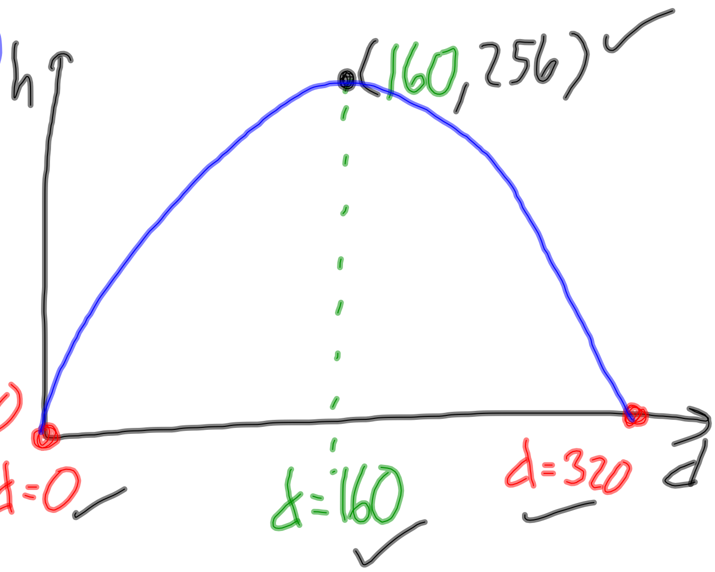
8. A golf ball is hit a distance of 320 yards, reaching a maximum height of 256 yards.

a) After how many yards will the ball reach its maximum height? 160 (half of 320)

b) Create a labelled sketch of the path of the ball including the vertex, y-intercept and x-intercepts, and the axis of symmetry.

c) Create an equation, **in vertex form**, for the flight of the ball.

b)



Option 1: Plug a point into vertex form, solve for a.

c)

$$y=a(x-h)^2+k$$

$$h=a(d-160)^2+256$$

Plug in h=0, d=0 ... solve for a

$$0=a(0-160)^2+256$$

$$0=a(-160)^2+256$$

$$0=a(25600)+256$$

$$-256 \qquad\qquad -256$$

$$\frac{-256}{25600}=\frac{a(25600)}{25600}$$

$$a=-0.01$$

$\therefore$ $h=-0.01(d-160)^2+256$ is our vertex form equation.

Option 2: Plug <u>the vertex</u> into the factored form equation, solve for a.

$$y = a(x - x_1)(x - x_2)$$

$$h = a(d - 0)(d - 320)$$

Plug in $h = 256$, $d = 160$... solve for a.

$$256 = a(160)(160 - 320)$$

$$256 = a(-25600)$$

$$\frac{256}{-25600} = \frac{a(-25600)}{-25600}$$

$$a = -0.01$$

Consolidation

Determine the equation for the parabola with **roots at -1 and 5**, with a **y-intercept of -2**.
Then sketch a 5*-point curve labelling all important information.

y-intercept	x-intercepts
vertex	axis of symmetry

(express your answer in **all three** forms)

Factored Form

$$y=a(x-x_1)(x-x_2)$$

$$y=a(x-(-1))(x-(5))$$

$$y=a(x+1)(x-5)$$

- We know that $a(+1)(-5)$ is our y-intercept (expansion into standard form)
- We know the y-intercept is -2.

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

$$\frac{-2}{-5}=\frac{-5a}{-5}$$

$$a=0.4$$

We know that the y-intercept happens when x = 0.
In this case, then, the point (0, -2) is on our curve.
If we plug in 0 for x and -2 for y. We can eliminate every variable except for a.
Therefore, we can solve for a.

$$y=0.4(x+1)(x-5)$$

Consolidation

Determine the equation for the parabola with **roots at -1 and 5**, with a **y-intercept of -2**.

(express your answer in **all three** forms)

Standard Form

To get to standard form expand and simplify.

$$y = 0.4[(x+1)(x-5)]$$

$$y = 0.4(x^2 - 5x + x - 5)$$

$$y = 0.4(x^2 - 4x - 5)$$

$$y = 0.4x^2 - 1.6x - 2$$

Consolidation

Determine the equation for the parabola with **roots at -1 and 5**, with a **y-intercept of -2**.

(express your answer in **all three** forms)

Vertex Form

We need h, k

$h = \frac{x_1 + x_2}{2}$ or $h = \frac{-b}{2a}$

$= \frac{(-1)+(5)}{2}$ $= \frac{-(-1.6)}{2(0.4)}$

$= \frac{4}{2}$ $= \frac{1.6}{0.8}$

$= 2$ $= 2$

To find k, plug x=2 into standard/factored form... solve for y

$y = 0.4(2)^2 - 1.6(2) - 2$

$y = 1.6 - 3.2 - 2$

$y = -3.6$

∴ vertex = (2, -3.6) and

$y = 0.4(x-2)^2 - 3.6$

Does the parabola defined by the function

$$y = 2x^2 - 12x + 10$$

meet the line defined by the equation

$$y = 4x - 14?$$

If yes, how many times and where?

$$2x^2 - 12x + 10 = 4x - 14$$

$$2x^2 - 12x - 4x + 10 + 14 = 0$$

$$2x^2 - 16x + 24 = 0$$

$$2(x^2 - 8x + 12) = 0$$

$$2(x-2)(x-6) = 0$$

Therefore, the parabola and the line meet when x = 2 and when x = 6.

To determine the y-values of the points of intersection, plug the x-values (separately) into either original equation, solve for y!