## Lesson 13: Number Line Distances

### 13.1: Math Talk: How Far?

Evaluate mentally: How far away is each house from the school?

Unable to process <img src="/image\_files/47.png">Failed: convert -density 300 /app/tmp/svgtopng-1605869136.030698.svg /app/tmp/svgtopng-1605869136.030698.png Backtrace: /app/app/services/script/runner.rb:35:in `block in call\_popen3' /app/vendor/ruby-2.6.6/lib/ruby/2.6.0/open3.rb:219:in `popen\_run' /app/vendor/ruby-2.6.6/lib/ruby/2.6.0/open3.rb:101:in `popen3' /app/app/services/script/runner.rb:30:in `call\_popen3' /app/app/services/script/runner.rb:26:in `run\_cmd' /app/app/services/script/svg\_to\_png.rb:19:in `convert\_svg\_to\_png' /app/app/services/script/svg\_to\_png.rb:12:in `to\_png' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/image\_downloader.rb:37:in `png\_rendered\_from\_svg' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/image\_downloader.rb:33:in `raw\_image\_data' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/image\_downloader.rb:13:in `block in save' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/image\_downloader.rb:13:in `tap' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/image\_downloader.rb:13:in `save' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/img\_tag\_attributes.rb:75:in `downloaded\_image' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/img\_tag\_attributes.rb:71:in `downloaded\_file\_url' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/img\_tag\_attributes.rb:31:in `src' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/img\_tag\_attributes.rb:20:in `to\_h' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/node\_processor.rb:13:in `img\_tag\_attrs' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/views/embeddable\_content/replacements/images/\_image\_embed.html.slim:5:in `\_vendor\_bundle\_ruby\_\_\_\_\_\_\_bundler\_gems\_embeddable\_content\_a\_\_\_c\_\_\_\_\_c\_\_app\_views\_embeddable\_content\_replacements\_images\_\_image\_embed\_html\_slim\_\_4180629115487305340\_70011007115440' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/base.rb:274:in `\_run' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/template.rb:185:in `block in render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications.rb:182:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/template.rb:385:in `instrument\_render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/template.rb:183:in `render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/partial\_renderer.rb:357:in `block in render\_partial' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/abstract\_renderer.rb:88:in `block in instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications.rb:180:in `block in instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications/instrumenter.rb:24:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications.rb:180:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/abstract\_renderer.rb:87:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/partial\_renderer.rb:346:in `render\_partial' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/partial\_renderer.rb:317:in `render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/renderer.rb:65:in `render\_partial\_to\_object' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/renderer.rb:53:in `render\_partial' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/helpers/rendering\_helper.rb:38:in `render' /app/vendor/bundle/ruby/2.6.0/gems/haml-5.1.2/lib/haml/helpers/action\_view\_mods.rb:15:in `render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/views/embeddable\_content/replacements/images/editable.html.slim:1:in `\_vendor\_bundle\_ruby\_\_\_\_\_\_\_bundler\_gems\_embeddable\_content\_a\_\_\_c\_\_\_\_\_c\_\_app\_views\_embeddable\_content\_replacements\_images\_editable\_html\_slim\_\_1898239810406054991\_70011359066780' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/base.rb:274:in `\_run' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/template.rb:185:in `block in render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications.rb:182:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/template.rb:385:in `instrument\_render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/template.rb:183:in `render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/template\_renderer.rb:58:in `block (2 levels) in render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/abstract\_renderer.rb:88:in `block in instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications.rb:180:in `block in instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications/instrumenter.rb:24:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/activesupport/lib/active\_support/notifications.rb:180:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/abstract\_renderer.rb:87:in `instrument' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/template\_renderer.rb:57:in `block in render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/template\_renderer.rb:65:in `render\_with\_layout' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/template\_renderer.rb:56:in `render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/template\_renderer.rb:13:in `render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/renderer.rb:61:in `render\_template\_to\_object' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/renderer/renderer.rb:29:in `render\_to\_object' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/rendering.rb:117:in `block in \_render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/base.rb:304:in `in\_rendering\_context' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/rendering.rb:116:in `\_render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionpack/lib/action\_controller/metal/streaming.rb:218:in `\_render\_template' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionview/lib/action\_view/rendering.rb:103:in `render\_to\_body' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionpack/lib/action\_controller/metal/rendering.rb:52:in `render\_to\_body' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionpack/lib/action\_controller/metal/renderers.rb:142:in `render\_to\_body' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionpack/lib/abstract\_controller/rendering.rb:46:in `render\_to\_string' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionpack/lib/action\_controller/metal/rendering.rb:41:in `render\_to\_string' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionpack/lib/action\_controller/renderer.rb:96:in `render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/rails-457d9dc939f1/actionpack/lib/action\_controller/metal/rendering.rb:11:in `render' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/template\_manager.rb:73:in `render\_path' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/template\_manager.rb:69:in `render\_target' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/replacement\_template\_manager.rb:4:in `replacement\_node' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/template\_based.rb:3:in `replacement\_node' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/template\_based.rb:12:in `replace\_node' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/images/node\_processor.rb:50:in `replace\_node' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/node\_processor.rb:44:in `process\_node' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/node\_processor.rb:23:in `process!' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/doc\_processor.rb:47:in `process\_node' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/doc\_processor.rb:37:in `block in process\_matching\_nodes' /app/vendor/bundle/ruby/2.6.0/gems/nokogiri-1.10.9/lib/nokogiri/xml/node\_set.rb:238:in `block in each' /app/vendor/bundle/ruby/2.6.0/gems/nokogiri-1.10.9/lib/nokogiri/xml/node\_set.rb:237:in `upto' /app/vendor/bundle/ruby/2.6.0/gems/nokogiri-1.10.9/lib/nokogiri/xml/node\_set.rb:237:in `each' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/doc\_processor.rb:37:in `with\_index' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/doc\_processor.rb:37:in `process\_matching\_nodes' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/doc\_processor.rb:19:in `process!' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/embedder.rb:39:in `each' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/embedder.rb:39:in `run\_doc\_processors' /app/vendor/bundle/ruby/2.6.0/bundler/gems/embeddable\_content-a737c50640c4/app/services/embeddable\_content/embedder.rb:19:in `embed\_content!' /app/app/services/export/document\_embedder.rb:4:in `embed' /app/app/services/export/document\_builder.rb:43:in `embedded\_text' /app/app/services/export/document\_builder.rb:17:in `rendered\_text' /app/app/services/export/default\_post\_processor.rb:5:in `rendered\_text' /app/app/services/export/default\_post\_processor.rb:22:in `rendered\_text\_io' /app/app/services/export/default\_post\_processor.rb:18:in `processed\_text\_io' /app/app/services/export/default\_post\_processor.rb:12:in `run' /app/app/services/export/document\_builder.rb:63:in `rendered\_text\_io' /app/app/services/export/document\_builder.rb:13:in `run' /app/app/models/document.rb:19:in `build\_attachment' /app/app/services/compression/document\_zipper.rb:11:in `block in documents' /app/app/services/compression/document\_zipper.rb:10:in `map' /app/app/services/compression/document\_zipper.rb:10:in `documents' /app/app/services/compression/document\_zipper.rb:6:in `blobs' /app/app/services/compression/blob\_zipper.rb:49:in `block in zip\_io' /app/vendor/bundle/ruby/2.6.0/gems/rubyzip-2.3.0/lib/zip/output\_stream.rb:63:in `write\_buffer' /app/app/services/compression/blob\_zipper.rb:48:in `zip\_io'

### 13.2: $a$ and $b$

1. For each pair of values, find $b−a$. Be prepared to explain your reasoning.
	1. $a=28,b=57$
	2. $a=\frac{4}{5},b=\frac{1}{2}$
	3. $a=27,b=-17$
	4. $a=-35,b=-19$
	5. $a=19,b=35$
	6. $a=-106,b=43$
2. For which pairs of values does the subtraction give the distance between the numbers on the number line?
	1. What do you notice about these pairs of numbers?
3. Given 2 numbers, how can you find the distance between them on the number line?

### 13.3: It’s That Far Away

1. Find 2 numbers that are $d$ away from $a$ on the number line.
	1. $a=14,d=6$
	2. $a=-7,d=16$
	3. $a=103,d=56$
	4. $a=4,d=138$
2. Use $d$ and $a$ to write 2 expressions that find the values that are $d$ away from $a$.
3. Kiran is looking at some old work where he did problems like this and found an answer that was marked correct. The answer is -18 and 46. Could Kiran figure out the values of $a$ and $d$ from the problem based on these values? If so, what are the values? If not, what additional information would help? Explain or show your reasoning.
4. In a planned neighborhood along Stepford Street, all of the houses are identical and equally distant from one another. The house at 102 Stepford Street is 2,250 feet from the house at 84 Stepford Street. Is there enough information to find the address of another house that is that same distance away from 84 Stepford Street? Explain your reasoning.



© CC BY 2019 by Illustrative Mathematics