In [1]:
```
library(tidyverse)
library(modelr)

# forces some modelling functions to warn if they drop missing values
options(na.action = na.warn)
```

```
── Attaching packages ─────────────────────────────────────── tidyverse 1.3.0 ──

✔ ggplot2 3.3.3     ✔ purrr   0.3.4
✔ tibble  3.0.6     ✔ dplyr   1.0.4
✔ tidyr   1.1.2     ✔ stringr 1.4.0
✔ readr   1.4.0     ✔ forcats 0.5.1

── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()    masks stats::lag()
```

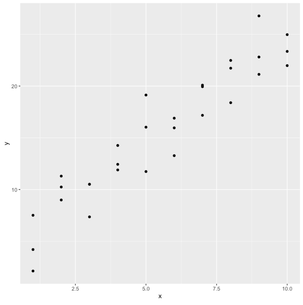
Let's look at the toy dataset `sim1` in the `modelr` library.

In [2]:
```
sim1
```

A tibble: 30 × 2

x <int>	y <dbl>
1	4.199913
1	7.510634
1	2.125473
2	8.988857
2	10.243105
2	11.296823
3	7.356365
3	10.505349
3	10.511601
4	12.434589
4	11.892601
4	14.257964
5	19.130050
5	11.738021
5	16.024854
6	13.273977
6	15.955975
6	16.894796
7	20.085993
7	17.171850
7	19.936309
8	21.725903
8	18.390913
8	22.475553
9	26.777010
9	22.805110
9	21.128305
10	24.968099
10	23.346422
10	21.975201

In [3]:
```
ggplot(sim1, aes(x, y)) + geom_point()
```

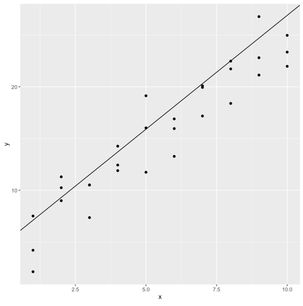


A linear model `y = a1 + a2*x` is defined by two parameters: `a1` and `a2`.

- The *parameters* are the placeholders for the numeric choices that give us a particular model

In [7]:
```
a1 <- 5
a2 <- 2

ggplot(sim1) +
    geom_point(aes(x,y)) +
    geom_abline(aes(slope=a2, intercept=a1))
```



For a particular model defined by `a = (a1, a2)` let's write a function to get the predictions of this model on the `x` values.

- For each `x` value in `sim1`, I want the `y` value as determined by the line `y=a1+a2*x`.

In [8]:
```
# the x-values in the sim1 dataset
sim1$x
```

1 · 1 · 1 · 2 · 2 · 2 · 3 · 3 · 3 · 4 · 4 · 4 · 5 · 5 · 5 · 6 · 6 · 6 · 7 · 7 · 7 · 8 · 8 · 8 · 9 · 9 · 9 · 10 · 10 · 10

In [15]:
```
linear_predictions <- function(a1, a2, data) {
    a1 + a2 * (data$x)
}

linear_predictions(4, 5, sim1)
```

9 · 9 · 9 · 14 · 14 · 14 · 19 · 19 · 19 · 24 · 24 · 24 · 29 · 29 · 29 · 34 · 34 · 34 · 39 · 39 · 39 · 44 · 44 · 44 · 49 · 49 · 49 · 54 · 54 · 54

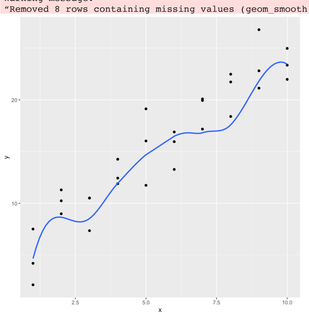
How can we evaluate a linear model?

- How can we get a numeric "score" for how well a model performs?

In [16]:
```
# why or why not not a model like this?
ggplot(sim1) +
    geom_point(aes(x,y)) +
    geom_smooth(aes(x,y), se=F, formula = y ~ poly(x, 2), span=1)
```

```
`geom_smooth()` using method = 'loess'

Warning message in simpleLoess(y, x, w, span, degree = degree, parametric = parametric, :
"pseudoinverse used at -1.9418 -1.2577"
Warning message in simpleLoess(y, x, w, span, degree = degree, parametric = parametric, :
"neighborhood radius 4.9673"
Warning message in simpleLoess(y, x, w, span, degree = degree, parametric = parametric, :
"reciprocal condition number  1.4742e-16"
Warning message in simpleLoess(y, x, w, span, degree = degree, parametric = parametric, :
"There are other near singularities as well. 24.674"
Warning message:
"Removed 8 rows containing missing values (geom_smooth)."
```



In [ ]:
```
```