ECO220Y1Y, Test #1, Prof. Murdock SOLUTIONS

(1) (a) Only two: negative (left) skewed and unimodal. (Failing to circle these or circling others are mistakes.)

(b)

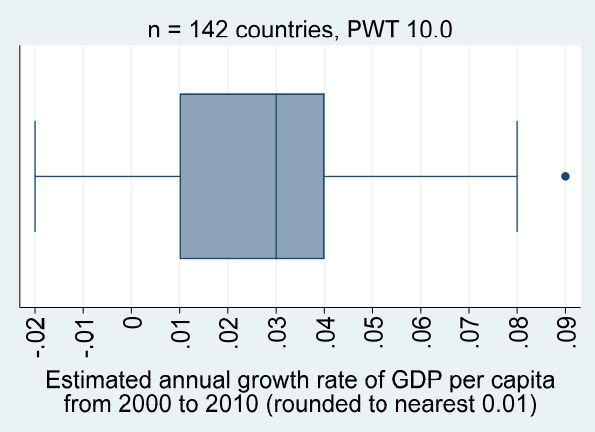
competitiveness

	Percentiles	Smallest		
1%	0	0		
5%	3	0		
10%	4	0	Obs	489
25%	6	0	Sum of Wgt.	489
50%	7		Mean	6.985685
		Largest	Std. Dev.	2.073891
75%	8	10		
90%	10	10	Variance	4.301024
95%	10	10	Skewness	-.9508847
99%	10	10	Kurtosis	4.003977

(2) The correlation is the covariance divided by the product of the standard deviations: $r = \frac{s_{xy}}{s_x s_y}$ (from the aid sheets).

$Corr(science, math) = r_{rm} = \frac{1299.42}{\sqrt{1152.55}\sqrt{1610.49}} = 0.95$

(3) (a)



(b) The variable named **r_2000_10** contains *estimates* of *GDP per capita growth rates* obtained by running *many* OLS regressions using the publicly posted PWT 10.0 data. Specifically, with the posted data we create a GDP per capita measure for each country in each year and then apply a natural log to it. Next, for each of the 142 countries we run a regression of the natural log of GDP per capita (the y variable) on the year (the x variable), which has 11 observations (the years 2000 to 2010), and record the slope estimate, which is the growth rate. This means 142 regressions to get from the posted data to the variable summarized by the tabulation.

(4) (a)

resp_id	comp	qualities	good_manners	indep	hard_wk	…	unselfish	obedience
1	6	Independence; Hard work; …	0	1	1	…	0	0
2	8	Good manners; Independent; …	1	1	0	…	0	0
…	…	…	…	…	…	…	…	…
489	7	… Not being selfish (unselfishness); Obedience	0	0	0	…	1	1

These data are cross-sectional because each observation corresponds to a specific student. There are 14 variables in the data above, where the first is an identifier variable and the rest code the responses to the survey questions.

(b) $s = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{X})^2}{n-1}} \approx \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{X})^2}{n}} = \sqrt{\frac{167(0-0.6585)^2+322(1-0.6585)^2}{489}} =$
$\sqrt{(1-0.6585)(0-0.6585)^2+0.6585(1-0.6585)^2} = 0.47$ [Note: A complete solution can exclude the grey part.]

(5) (a) A <u>10 percentage point increase</u> would be going from a math test where 50 percent of the questions – for example, 25 of 50 questions – have a monetary theme to one where 60 percent of the questions – for example, 30 of 50 questions – have a monetary theme, which would be a <u>20 percent increase</u> (=100*10/50) in the proportion of questions with a monetary theme.

(b) Because the excerpts clearly specifies that the explanatory (x) variable – the percent of questions on a math test with a monetary theme – is *randomly* assigned we know that these are experimental data. This will allow us to estimate the causal effect of monetary themed questions on student performance of a math test, which is the dependent (y) variable. [We may separately estimate this effect by various subgroups (e.g. disadvantaged students).]

(6) Can find the starting and ending point of each line:

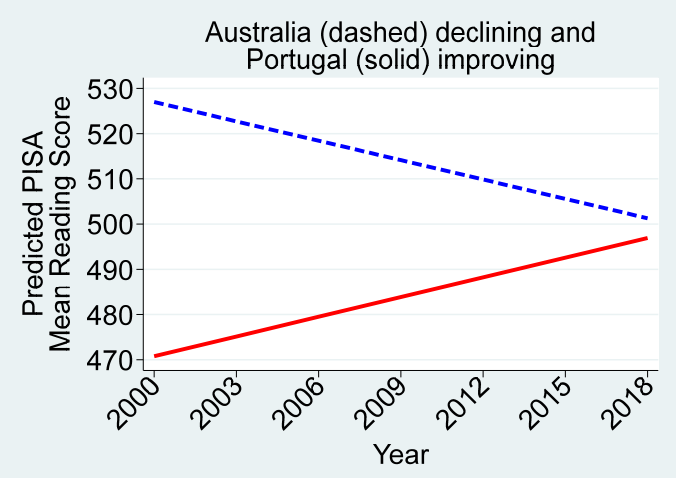
For Australia, reading-hat = 3384.143 - 1.428571*2000 = 527

For Australia, reading-hat = 3384.143 - 1.428571*2018 = 501

For Portugal, reading-hat = -2433.976 + 1.452381*2000 = 471

For Portugal, reading-hat = -2433.976 + 1.452381*2018 = 497

Over the period from 2000 through 2018, on average the mean PISA reading scores in Australia have been declining by 1.4 points per year whereas they have been improving by 1.5 points per year in Portugal. At the start of the period Australia had scores about 12 percent higher than Portugal, but by the end it was less than 1 percent higher.



(7) These are grouped data. We choose a representative value for each group to compute the approximate mean:

$$0.186(25) + 0.220(14.5) + 0.158(5) + 0.310(0) + 0.063(-5) + 0.035(-14.5) + 0.028(-25) = 7.1$$

As of mid-2021 and early 2022, for people from 27 countries who primarily worked from home during at least part of the pandemic, on average they were about 7.1 percent more productive than they would have expected to be pre-pandemic. The average surprise was a modest positive boost in productivity relative to expectations.

(8) (a) For these luxury slides – outdoor slippers – sold via auction, the rarer red color received bids that were on average approximately 3.9 percent higher than the less rare black color. This is a modest boost, which may reflect the allure of exclusivity – having the rarer color, even if you do not care about the color – or it could be that people like red better and are willing to pay more.

(b) For slides where the quantity offered of that size and color combination is 10 percent higher, on average the bid amount is approximately 0.5 percent lower, which is small negative elasticity (near zero) meaning less rare slides get somewhat lower bids.