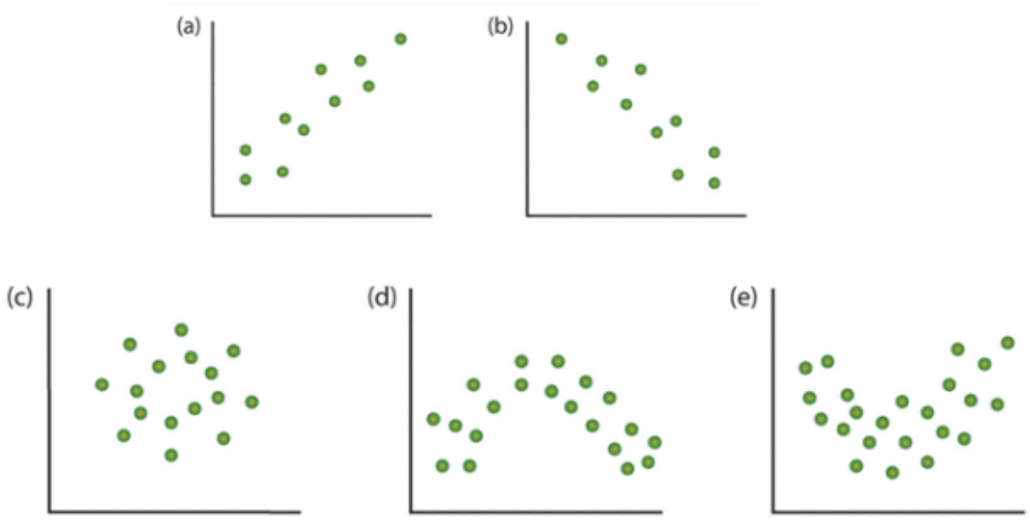
1. **Which of the following scatterplot(s) would fitting a linear regression model to the data be appropriate? (Select all that apply.)**



- [x] a

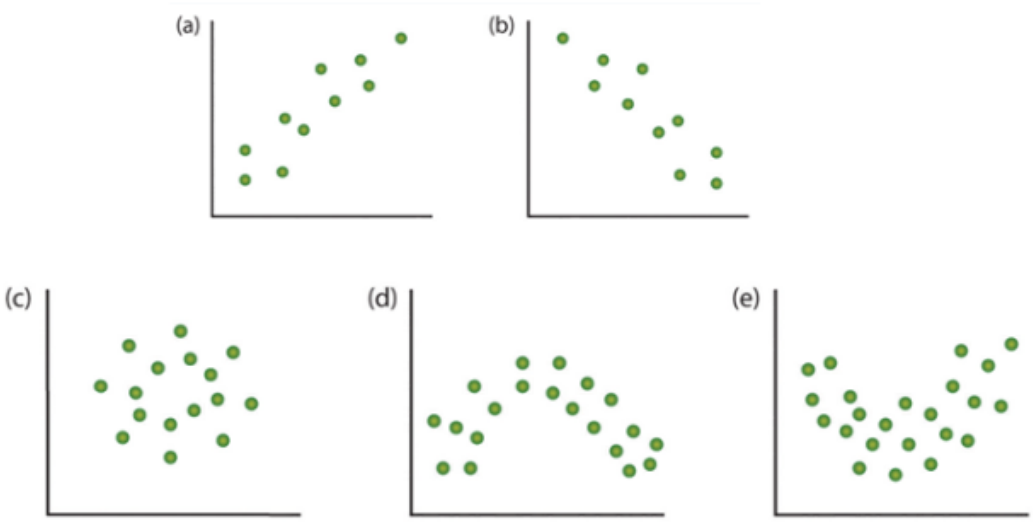
  ✓ Correct

- [x] b

  ✓ Correct

- [ ] c
- [ ] d
- [ ] e

2. **Which of the following scatterplot(s) would have a correlation coefficient that is close to 0? (Select all that apply.)**



- [ ] a
- [ ] b
- [x] c

✓ Correct

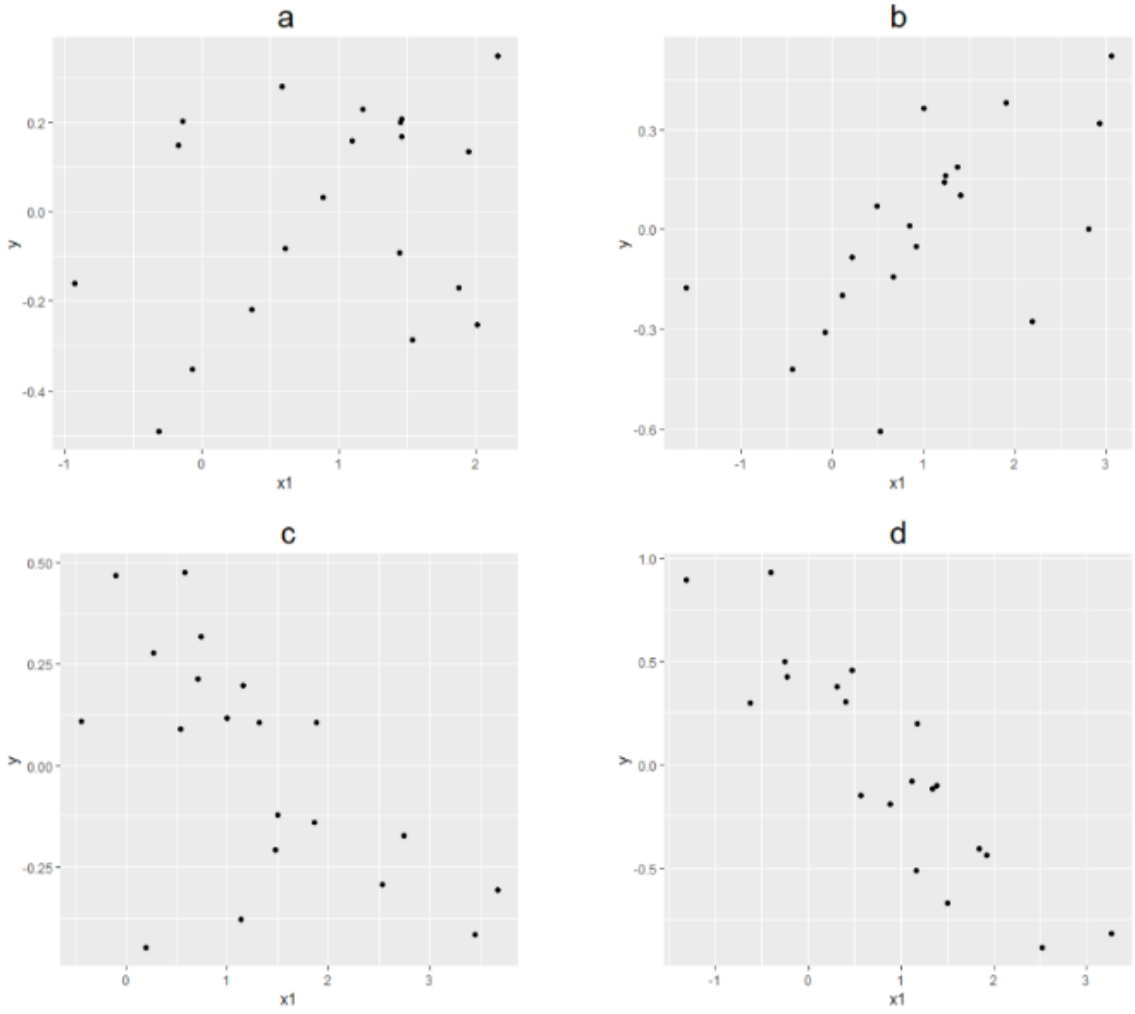
- [x] d

✓ Correct

- [x] e

✓ Correct

3. **Which of the following scatterplots would have the highest absolute correlation (i.e. shows the strongest linear relationship?**



- a
- b
- c
- d

4. **What distribution do the true errors need to follow in order to perform various inference procedures in linear regression?**

- ○ True errors must be N(0,1)
- ◉ True errors must be N(0, σ2)
- ○ True errors must be Uniformly distributed
- ○ True errors do not need any specific distribution

✓ **Correct**

5. **Which of the following are assumptions needed for conducting a hypothesis test on the population slope in a linear regression analysis? (Select all that apply.)**

- ☑ True errors must be normally distributed.

✓ **Correct**

- ☑ True errors have constant variance.

✓ **Correct**

- ☑ The population relationship between the dependent variable and the explanatory variable is in fact linear.

✓ **Correct**

6. **A study was conducted to model the linear relationship between Las Vegas nightly hotel cost (dollars) and hotel rating (on a 100 point scale). Nightly hotel cost will be used to predict hotel rating. A random sample of 30 Las Vegas hotels was collected and an estimated slope (b1) was found to be 0.21. Which of the following is a correct interpretation of the estimated slope (b1)?**

- ○ When a hotel's nightly cost is $0 dollars the hotel's rating is expected to be 0.21 points.
- ○ When a hotel rating is 0 points the hotel's nightly cost is expected to be $0.21 dollars.
- ◉ The hotel rating is estimated to increase by 0.21 points for every additional dollar spent on nightly hotel cost, on average.
- ○ The nightly hotel cost is estimated to increase by $0.21 dollars for every additional hotel rating point, on average.

✓ **Correct**

7. **Background for Questions 7 - 13**

In 1905, R.J. Gladstone conducted a study of the relationship between brain weight and size of the head. Brain weight (grams) and head size (cubic cm) measurements were performed for 237 adults. Two categorical variables for Sex (0=male, 1=female) and Age (0=young, 20-46 years old, 1=old, 46+ years old) are available. The linear regression results for regressing brain weight on the head size are summarized below.

	mean	sd	se(mean)	n
Brain	1282.873	120.34	7.82	237
Head	3633.992	365.26	23.73	237

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	325.573	47.141	6.906	4.61e-11
Head	0.26343	0.0129	20.409	< 2e-16

One subject in the study has a head size of 3500 cm3 and a brain weight of 1430.86 grams. What is the value of the observed error (residual) for this subject?

- ○ -183.3 grams
- ◉ 183.3 grams
- ○ -4195.752 cm3
- ○ 4195.752 cm3

✓ **Correct**

8. **The study relating brain weight (grams) and head size (cubic cm) yielded an R-squared of 0.6393. Which of the following is a correct interpretation of the R-squared?**

- ○ 0.6393% of the variation in brain weight can be accounted for by the linear relationship with head size.
- ◉ 63.93% of the variation in brain weight can be accounted for by the linear relationship with head size.
- ○ We would expect brain weight to increase by 0.6393 grams for every additional cubic cm in head size, on average.
- ○ We would expect head size to increase by 0.6393 cubic cm for every additional gram in brain weight, on average.

✓ **Correct**

9. **What is the appropriate p-value for testing if there is a significant positive linear relationship between brain weight and head size?**

- ○ 4.61e-11
- ○ <2e-16
- ○ 2.305e-11
- ◉ <1e-16

✓ **Correct**

10. **A 95% confidence interval for the mean brain weight for all adults in 1905 with a head size of 3400 cm3 was calculated to be (1210.14 grams, 1232.33 grams). How would the width of the 95% prediction interval for the brain weight for an individual adult in 1905 with a head size of 3400 cm3 compare to this one?**

- (●) Wider
- ( ) Narrower
- ( ) Stays the same

✓ **Correct**

11. **A 95% confidence interval for the mean brain weight for all adults in 1905 with a head size of 3400 cm3 was calculated to be (1210.14 grams, 1232.33 grams). How would the width of the 95% confidence interval for the mean brain weight for all adults in 1905 with a head size of 3600 cm3 compare to this one?**

- ( ) Wider
- (●) Narrower
- ( ) Stay the same

✓ **Correct**

12. **The head size of an 8 year old child is found to be 1800 cm3, What caution(s) should be noted if asked to predict this child's brain weight? (Select all that apply.)**

- [ ] Correlation does not imply causation for brain weight.
- [x] Extrapolation - A head size of 1800 cm3 is outside the range of our data.

  ✓ **Correct**

- [x] Extrapolation - The model was created using only data for adults, not children.

  ✓ **Correct**

- [ ] We do not know if the child is male or female.
- [ ] No cautions need to be noted, it is fine to plug in the 1800 cm3 in to our estimated regression line to make the prediction.

13. **A new model was fit, this time adding in the two categorical variables Sex (0=male, 1=female) and Age (0=young, 20-46 years old, 1= old, 46+ years old), the model summary is shown below**

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	464.56	68.98	6.735	1.27e-10
Head	0.2442	0.015	16.212	< 2e-16
Sex	-22.54	11.06	-2.039	0.0426
Age	-23.97	9.48	-2.528	0.0121

Which of the following is an appropriate interpretation of the estimated coefficient for age of -23.97 in the above table?

- ○ The average brain weight for younger subjects is estimated to be 23.97 grams less than the average brain weight for older subjects.
- ○ Keeping head size and sex constant, the average brain weight for younger subjects is estimated to be 23.97 grams less than the average brain weight for older subjects.
- ○ The average brain weight for older subjects is estimated to be 23.97 grams less than the average brain weight for younger adults.
- ◉ Keeping head size and sex constant, the average brain weight for older subjects is estimated to be 23.97 grams less than the average brain weight for younger adults.

✓ **Correct**