Math Quiz Answer Key

Basic Algebra Answers

1) 16
2) 121
3) 25
4) 36
5) $^1/_2$
6) $(x + 3)(x - 2)$
7) $2x^2 + 3x - 35$
8) m is the slope; b is the y-intercept
9) 10^x

Higher Algebra Answers

1) The function crosses the y-axis
2) Rise over run
3) False. It is a *quadratic* equation.
4) True. It has a positive leading coefficient, meaning it opens upward.
5) 3. It crosses the x-axis three times.
6) An equation with order (highest exponent) of 2.
7) $x^3 + 2x^2 - x - 2$
8) $5x(x + 5)(x - 2)$
9) False. This is only the case if the leading coefficient is negative (parabola opens down).

Unit Conversion Answers

1) False. Example: the kilogram (kg) is heavier than the pound (lb.).
2) It is 1,000 greater than the base unit
3) 5 kg
4) 30 km (pay attention to units)
5) 2.3 g/cm^3
6) 8 L
7) 36 minutes
8) 2.04 hours
9) $F = (C \times 9/5) + 32$

Basic Probability

1) $1\ in\ 216$
2) $1\ in\ 2$
3) 25%
4) 75%
5) 50%
6) False. $P(A|B) \neq P(B|A)$
7) True
8) The person has only a high school education. The base rate of people who have only graduated high school is much higher than people who have a PhD.
9) True. This is the famous Monty Hall problem.

Statistics Literacy

1) Eve.
   - Alice makes a sampling error, since she is obtaining her sample from people who are (A) already in a microbiology class, and so probably have some interest in the science, and (B) are people who know Alice and have interacted with them. In other words, the sample is not representative.
   - Bob has a participation bias, since the survey is made available to people who already agree with his politics.
   - Claire removes people from her sample (conservative Christians) to control for bias, but it in fact is a bias itself.
   - David's sample is small and unrepresentative, suffering convenience sampling and self-selection bias.
   - Frank also suffers convenience sampling and self-selection bias, as well as potentially introducing bias by rewarding participants for their contribution.

2) A survey of 500 people found that the average yearly income was $49,000 (S.D.=$9,200; 99% C.I.). This is the only one that includes $50,000 within the confidence interval.

3) The mean is the average. The median is the midpoint. The standard deviation is how spread out the data are from the average.

4) False. A theory is not the same thing as a hypothesis, and a hypothesis test is done in order to accept or reject the *null* hypothesis.

5) False. For example, in a bimodal distribution, or a skewed distribution.

6) The following six have $p < \alpha$
   - $\alpha = 0.1; p = 0.08$
   - $\alpha = 0.05; p = 0.049$
   - $\alpha = 0.05; p = 0.023$
   - $\alpha = 0.05; p < 0.05$
   - $\alpha = 0.05; p = 0.04598939$
   - $\alpha = 0.05; p \leq 0.005$

7) The result was unlikely due to chance. This is what the p-test indicates. A p of less than 0.05 means there is less than a 5% chance that the result was obtained due to chance.

8) False. The reason that most car accidents happen within a few miles of a person's residence is because that is where people do most of their driving. In other words, the base rate of "where a person drives" is heavily in favor of the few miles within a person's residence. The true risk of getting in an accident on a single particular drive will depend a lot more on local conditions.

9) False. Obtaining a larger sample will help reduce error, but not necessarily standard deviation. The standard deviation reflects the actual deviation in the sample or population (such as the spread of different heights among human beings), not the error.

Links to Quizzes

Test your **basic algebra** knowledge: https://www.surveymonkey.com/r/CNJT69P – Nine questions covering basic operations, polynomials, factoring, and linear equations

Test your **higher algebra** knowledge: https://www.surveymonkey.com/r/QLPSGKG – Nine questions covering linear equations, factoring, and quadratic equations

Test your **unit conversion** knowledge: https://www.surveymonkey.com/r/SHMJN9R – Metric to metric, metric to imperial, density, speed, distance

Test your **probability** knowledge: https://www.surveymonkey.com/r/SB9LWKP – Nine questions covering basic probability (dice rolls, coin flips, etc.)

Test your **statistics** knowledge: https://www.surveymonkey.com/r/S3SNVD9 – Nine questions covering basic statistics concepts and interpretation of data and results