## SAT MATH PREP Practice Problems

Ratio, Proportion, Units, and Percentage
Example \#1: On Thursday, 240 adults and children attended a show. The ratio of adults to children was 5 to 1 . How many children attended the show?
A. 40
B. 48
C. 192
D. 200

Example \#2: On an architect's drawing of the floor plan of a house, 1 inch represents 3 feet. If a room is represented on the floor by a rectangle that has side lengths 3.5 inches and 5 inches, what is the actual floor area of the room, in square feet?
A. 17.5
B. 51
C. 52.5
D. 157.5

Example \#3: Scientists estimate the Pacific Plate, one of Earth's tectonic plates, has moved about 1060 kilometers in the past 10.3 million years. What was the average speed of the Pacific Plate during that time period in centimeters per year? There are $100,000 \mathrm{~cm}$ in one km.
A. 1.03
B. 10.3
C. 103
D. 1030

Example \#4: County Y consists of two districts. One district has an area of 30 square miles and a population density of 370 people per square mile, and the other district has an area of 50 square miles and a population density of 290 people per square mile. What is the population density, in people per square mile, for all of County Y?

Example \#5: A furniture store buys its furniture from a wholesaler. For a particular table, the store usually charges its cost from the wholesaler plus 75\%. During a sale, the store charged the cost from the wholesaler plus $15 \%$. If the sales price of the table was $\$ 299$, what is the usual price of the table?
A. $\$ 359$
B. $\$ 455$
C. $\$ 479$
D. $\$ 524$

Example \#6:


A grocery store sells pints of raspberries and sets the price per pint each week. The scatterplot above shows the price and number of pints of raspberries sold for 19 weeks, along with the line of best fit for the data and the equation of the line of best fit.
a) According to the line of best fit, how many pints of raspberries would the store be predicted to sell in a week when the price of raspberries is $\$ 4.50$ per pint.
b) For how many of the 19 weeks shown was the number of pints of raspberries sold greater than the number predicted by the line of best fit?
c) What is the best interpretation of the slope of the line of best fit in this context?
d) What is the best interpretation of the $y$-intercept of the line of best fit in this context?

Example \#7:

| Time (hours) | Number of bacteria |
| :---: | :---: |
| 0 | $1.0 \times 10^{3}$ |
| 1 | $4.0 \times 10^{3}$ |
| 2 | $1.6 \times 10^{4}$ |
| 3 | $6.4 \times 10^{4}$ |

The table above gives the initial number (at time $t=0$ ) of bacteria placed in a growth medium and the number of bacteria in the growth medium over 3 hours. Which of the following functions best models the number of bacteria, $\mathrm{N}(\mathrm{t})$, after t hours?
A. $N(t)=4000 t$
B. $N(t)=1000+3000 t$
C. $N(t)=1000\left(4^{-t}\right)$
D. $N(t)=1000\left(4^{t}\right)$

Example \#8: A bank has opened a new branch and, as part of a promotion, the bank branch is offering $\$ 1,000$ certificates of deposit at a simple interest of $4 \%$ per year. The bank is selling certificates with terms of $1,2,3$, or 4 years. Which of the following functions gives the total amount, $A$, in dollars, a customer will receive when a certificate with a term of $k$ years is finally paid?
A. $\quad A=1,000(1.04 k)$
B. $A=1,000(1+0.04 k)$
C. $A=1,000(1.04)^{k}$
D. $A=1,000\left(1+0.04^{k}\right)$

Note: The following information would not be given on the test, but you should memorize it. The formula for simple interest is $A=P(1+r t)$ where $A$ is the amount you get after the interest is paid, P is the original amount, r is the interest rate, and t is the amount of time the investment is left in the bank.

Example \#9: A bank has opened a new branch and, as part of a promotion, the bank branch is offer $\$ 1,000$ certificates of deposit at an interest rate of $4 \%$ per year, compounded semiannually. The bank is selling certificates with terms of $1,2,3$, or 4 years. Which of the following functions gives the total amount, $A$, in dollars, a customer will receive when the a certificate with a term of $k$ years I finally paid?
A. $A=1,000(1+0.04 k)$
B. $A=1,000(1+0.08 \mathrm{k})$
C. $A=1,000(1.04)^{k}$
D. $A=1,000(1.02)^{2 k}$

Note: This is an example of COMPOUND interest. Instead of getting the interest once a year (like they did in simple interest), you get the interest paid on the interest and so on. The general formula for compound interest is $A=P\left(1+\frac{r}{n}\right)^{n t}$ where $P$ is the original amount, $r$ is the interest rate, n is the number of times you get the interest per year (semiannually is 2 times per year) and $t$ is the number of years the deposit is held.

Example \#10:


Each evening, Maria walks, jogs, and runs for a total of 60 minutes. The graph above shows Maria's speed during the 60 minutes. Which segment of the graph represents the time when Maria's speed is the greatest?
A. The segment from $(17,6)$ to $(19,8)$
B. The segment from $(19,8)$ to $(34,8)$
C. The segment from $(34,8)$ to $(35,6)$
D. The segment from $(35,6)$ to $(54,6)$

Example \#11: A store is deciding whether to install a new security system to prevent shoplifting. Based on store records, the security manager of the store estimates that 10,000 customers enter the store each week, 24 of whom will attempt to shoplift. Based on the data provided from other users of the security system, the manager estimates the results of the new security system in detecting shoplifters would be as shown in the table below.

|  | Alarm <br> sounds | Alarm does <br> not sound | Total |
| :--- | :---: | :---: | :---: |
| Customer attempts to <br> shoplift | 21 | 3 | 24 |
| Customer does not attempt <br> to shoplift | 35 | 9,941 | 9,976 |
| Total | 56 | 9,944 | 10,000 |

According to the manager's estimates, if the alarm sounds for a customer, what is the probability that the customer did not attempt to shoplift.
A. $0.03 \%$
B. $0.35 \%$
C. $0.56 \%$
D. $62.5 \%$

## Example \#12:



The histogram above summarizes the distribution of time worked last week, in hours, by the 40 employees of a landscaping company. In the histogram, the first bar represents all workers who worked at least 10 hours but less than 20 hours; the second represents all workers who worked at least 20 hours but less than 30 hours; and so on. Which of the following could be the median and mean amount of time worked, in hours, for the 40 employees?
A. Median $=22$, Mean $=22$
B. Median $=24$, Mean $=22$
C. Median $=26$, Mean $=32$
D. Median $=32$, Mean $=30$

Example \#13:


The dot plots above show the distribution of scores on a current events quiz for two classes of 24 students. Which of the following correctly compares the standard deviation of the scores in each class?
A. The standard deviation of quiz scores in Class A is smaller.
B. The standard deviation of quiz scores in Class B is smaller.
C. The standard deviation of quiz scores in Class A and Class B are the same.
D. The relationship cannot be determined from the information given.

Margin of Error: You won't have to calculate this on the test, but you do have to know what it means.

Margin of Error is affected by two factors: the variability in the data and the sample size. The larger the standard deviation (more variability), the larger the margin of error. The smaller the standard deviation (less variability), the smaller the margin of error. If you increase the sample size, then the random sample provides more information and reduces the margin of error.

Margin of Error applies to the population not individuals. Let's say we find that a sample population watches between 12.5 and 15.7 hours of TV per week. That does not mean that every individual in the sample falls in that interval.

Example \#14: A quality control researcher at an electronics company is testing the life of the company's batteries in certain cameras. The researcher selects 100 batteries at random from the daily output of the batteries and finds that the life of the batteries has a mean of 342 pictures with an associated margin of error of 18 pictures. Which of the following is the most appropriate conclusion based on these data?
A. All batteries produced by the company that day have a life between 324 and 360 pictures.
B. All the batteries ever produced by the company have a life between 324 and 360 pictures.
C. It is plausible that the mean life of batters produced by the company that day is between 324 and 360 pictures.
D. It is plausible that the mean life of all the batteries ever produced by the company is between 324 and 360 pictures.

## Can the results of a study be generalized to the entire population? Can a cause-and-effect relationship be established?

|  | Subjects Selected at Random | Subjects Not Selected at Random |
| :---: | :---: | :---: |
| Subjects randomly assigned to treatments | - Results can be generalized to the entire population. <br> - Conclusions about cause and effect can appropriately be drawn. | - Results cannot be generalized to the entire population. <br> - Conclusions about cause and effect can appropriately be drawn. |
| Subjects not randomly assigned to treatments | - Results can be generalized to the entire population. <br> - Conclusions about cause and effect should not be drawn. | - Results cannot be generalized to the entire population. <br> - Conclusions about cause and effect should not be drawn. |

NOTE: A treatment is any factor that is deliberately varied in an experiment.

Example \#15: A community offers a Spanish course. This year, all students in the course were offered additional audio lessons they could take at home. The students who took these additional audio lessons did better in the course than the students who didn't take the additional audio lessons. Based on these results, which of the following is the most appropriate conclusion?
A. Taking additional audio lessons will cause an improvement for any student who takes any foreign language course.
B. Taking additional audio lessons will cause an improvement for any student who takes a Spanish course.
C. Taking additional audio lessons was the cause of the improvement for the students at the community center that took the Spanish course.
D. No conclusion about cause and effect can be made regarding students at the community center who took the additional lessons at home and their performance in the Spanish course.

Practice on Khan Academy:
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