BASIC PROBABILITY QUESTIONS

#1a $P(A) * P(B)$ **#1b**   Events must be **independent**.

#2 $P(A) + P(B) - P(A \cap B)$

#3   **Sample Set**

#4 $0 \leq P(Event) \leq 1$

#5   1

#6   **False.**   **It's the opposite. Outcomes are the possible results for any given event.**

#7   *"and" is the same as* $\cap$. *In probability notation, it means that BOTH events must occur*

#8   *"or" is the same as* $\cup$. *In probability notation, it means that BOTH events must occur*

PROBABILITY CALCULATIONS USING NORMAL CURVES

For probabilities using the population distribution:

Population mean (μ) = 500   **and**   **Population Standard Deviation (σ) = 25**

For probabilities using a sampling distribution: **Standard Deviations For Samples Are Lower, Must Divide** σ **By** $\sqrt{n}$

Any samples will also have a mean of 500.

$\overline{X}$ **= 500** $S_x = \dfrac{25}{\sqrt{n}}$ **n = sample size (number of data items)**

#9   **Notice no mention of sample or sample size. This probability calculation involves the population distribution.**

$P(X < 477) =$ **17.9%**   **Use the formula Norm.Dist with inputs discussed above. BIG NOTE: Last input is just "true".**

#10   Again notice no mention of sample or sample size. This probability calculation involves the population distribution.

$$P(X > 535) = 1 - P(X < 535)$$ Note Excel only calculates probabilities from a value of X to the negative infinity (to the left).

1 -   91.9%   =   **8.1%**

#11   Now notice here we are talking about an average (mean) of 498 or more for a five day period (n = 5).

$$P(\bar{X} > 498) = 1 - P(\bar{X} < 498) = 1 -$$ 42.9%   =   57.10%

Same mean of 500 but standard deviation will be 25 divided by the square root of n which equals five. $\dfrac{25}{\sqrt{5}}$ =   11.18 **= S$_X$**

Now just use these inputs in Norm.Dist formula.

#12   Proportion word is the same as probability in this context. Notice no mention of sample so we use population distribution inputs.

$$P(480 < X < 510)$$ First find $P(X < 510) =$ 65.5%   Then find $P(X < 480) =$ 21.2%

$$P(480 < X < 510) = 65.5\% - 21.2\% = \mathbf{44.3}\%$$

#13   Notice this question asks for "mean sales" over a 30-day month. That ques us to use a sampling distribution.

The population standard deviation of 25 will have to be divided by square root of 30. $S_x = \dfrac{25}{\sqrt{30}}$ =   4.56

Now just use Norm.Dist with X of 494, mean of 500, standard deviation of 4.56.

$$P(\bar{X} < 494) =$$ **9.4%**

#14   "Randomly selecting 50 days" is describing a sample. Notice it's proving a sample size of 50.

$S_x = \dfrac{25}{\sqrt{50}}$ =   3.54 $P(499 < \bar{X} < 503) =$ $P(\bar{X} < 503)$ - $P(\bar{X} < 499) =$

80.2%   -   38.9%   =   **41.3%**

#15   See Class Notes: Second semester I'll show you how to draw normal probability distributions using Excel.

#16   Since the events ("state of the economy" and "more competition surfaces") are independent, we can use the multiplication rule to find the probabilities.

16a-d.   16e. Now multiply each probability by the value of its outcome.

$\text{P(Boom} \cap \textit{Competition}) = .65 * .25) =$ 0.1625   X $30   = $4.88

$\text{P(Boom} \cap \textit{No Competition}) = .65 * .75) =$ 0.4875   X $70   = $34.13

$\text{P(Recession} \cap \textit{Competition}) = .35 * .25) =$ 0.0875   X $10   = $0.88

$\text{P(Recession} \textit{No Competition}) = .35 * .75) =$ 0.2625   X $40   = $10.50

Now just add the 4 components.

Notice they sum to 100%!!   **EXPECTED VALUE OF FACEBOOK**   **$50.38**

This is just a a fictitious model. Do not run out and buy Facebook.