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) = 200 and Population Standard Deviation (σ) = 20

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 200.

$\overline{X}$ = 200 $S_x = \frac{20}{\sqrt{n}}$ n = sample size (number of data items)

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

$P(X < 227) =$ 91.1% 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.

$P(X > 220) = 1 - P(X < 220)$ Note Excel only calculates probabilities from a value of X to the negative infinity (to the left).

1 - 84.1% = 15.9%

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

$P(\bar{X} > 204) = 1 - P(\bar{X} < 204)$ = 1 - 70.2% = 29.8%

Same mean of 200 but standard deviation will be 20 divided by the square root of n which equals seven. $\frac{20}{\sqrt{7}}$ = 7.5593 = 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.

$P(185 < X < 208)$ First find $P(X < 208)$ = 65.5% Then find $P(X < 185)$ = 22.7%

$P(185 < X < 208) = 65.5\% - 22.7\% = 42.8\%$

#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 20 will have to be divided by square root of 30.

$S_x = \frac{20}{\sqrt{30}}$ = 3.65

Now just use Norm.Dist with X of 197, mean of 200, standard deviation of 3.65 .

$P(\bar{X} < 197)$ = 20.6%

#14 "Randomly selecting 100 days" is describing a sample. Notice it's proving a sample size of 100.

$S_x = \frac{20}{\sqrt{100}}$ = 2.00 $P(199 < \bar{X} < 202)$ = $P(\bar{X} < 202)$ - $P(\bar{X} < 199)$ =

84.1% - 30.9% = 53.3%

#15 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.

$P(\text{Boom} \cap \textit{Competition}) = .85 * .40) =$ **0.3400**

$P(\text{Boom} \cap \textit{No Competition}) = .85 * .60) =$ **0.51**

$P(\text{Recession} \cap \textit{Competition}) = .15 * .40) =$ **0.06**

$P(\text{Recession } \textit{No Competition}) = .15 * .60) =$ **0.09**

Notice they sum to 100%!!

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

X	**$20**	**=**	$6.80		
X	**$80**	**=**	$40.80		
X	**$10**	**=**	$0.60		
X	**$30**	**=**	$2.70		

Now just add the 4 components.

EXPECTED VALUE OF FACEBOOK **$50.90**

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