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* ∩. *In probability notation, it means that BOTH events must occur*

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

PROBABILITY CALCULATIONS USING NORMAL CURVES

For probabilities using the population distribution:

Population mean (μ) = 650 and Population Standard Deviation (σ) = 45

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

Any sampling distribution will also have a mean of 650.

$S_x = \frac{45}{\sqrt{n}}$ n = sample size (number of selections)

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

$P(X > 670) = 1 - P(X < 670)$ Note Excel only calculates probabilities from a value of X to the negative infinity (to the left). So we calculate the probability with X=670, and subtract that from 100%.

1 - 67.2% = 32.8% Use the formula Norm.Dist with inputs discussed above. **BIG NOTE: Last input is just "true".**

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

$P(X < 600) =$ 13.3% Use the formula Norm.Dist with inputs discussed above. **BIG NOTE: Last input is just "true".**

#11 Now notice here we are talking about an average (mean) of 640 or more harvested roses for a seven day week (n = 7).

Same mean of 650 but standard deviation will be 45 divided by the square root of n (n=7 in this case).

Now just use these inputs in Norm.Dist formula.

$\frac{45}{\sqrt{7}}$ = 17.01 = S_x

$P(\bar{X} > 640) = 100\% - P(\bar{X} < 640)$ = 100% - 27.8% = 72.2%

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

$P(660 < X < 705)$ First find $P(X < 705)$ = 88.9% Then find $P(X < 660)$ = 58.8%

$P(660 < X < 705) = 88.9\% - 58.8\% = 30.1\%$

#13 Notice this question asks for "mean number of roses harvested" over a 30-day month. That leads us to use a sampling distribution. The population standard deviation of 45 will have to be divided by the square root of 30.

$S_x = \frac{45}{\sqrt{30}}$ = 8.22

Now just use Norm.Dist with X of 660, mean of 650, standard deviation of 8.22.

$P(\bar{X} > 660) = 100\% - P(\bar{X} < 660)$ = 100% - 88.8% = 11.2%

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

$S_x = \frac{45}{\sqrt{90}}$ = 4.74 $P(645 < \bar{X} < 658) = P(\bar{X} < 658) - P(\bar{X} < 645) =$

95.4% - 14.6% = 80.8%

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

15a-d. 15e. Now multiply each probability by the value of its outcome.

$P(Boom \cap Competition) = .85 * .35)$ = 29.75% X $35 = $10.41

$P(Boom \cap No\ Competition) = .85 * .65)$ = 55.25% X $80 = $44.20

$P(\text{Recession} \cap \textit{Competition}) = .15 * .35) =$	5.25%	X	$25	=	$1.31
$P(\text{Recession} \cap \textit{No Competition}) = .15 * .65) =$	9.75%	X	$50	=	$4.88

Now just add the 4 components.

Notice they sum to 100%!!

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