Texas Geometry
Topic 15 - Review Solutions

1. A permutation is a grouping of items in which order is important.

2. Experimental probability is calculated based on the outcomes of experiments.

3. The outcomes of dependent events affect each other.

4. A geometric probability is a probability found by calculating the ratio of two lengths of two areas.

5. $$\begin{aligned} P(\text{science}) &= \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} \\ &= \frac{9}{30} \\ &= \frac{3}{10} \end{aligned}$$

6. $$\begin{aligned} P(\text{not music}) &= 1 - P(\text{music}) \\ &= 1 - \frac{3}{30} \\ &= \frac{27}{30} \\ &= \frac{9}{10} \end{aligned}$$

7. $$\begin{aligned} P(\text{reading}) &= \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} \\ &= \frac{0}{30} \\ &= 0 \end{aligned}$$

8. $$\begin{aligned} P(\text{not math}) &= 1 - P(\text{math}) \\ &= 1 - \frac{12}{30} \\ &= \frac{18}{30} \\ &= \frac{3}{5} \end{aligned}$$

9. $$\begin{aligned} P(\text{strike}) &= \frac{\text{number of times the event occurs}}{\text{number of times the experiment is done}} \\ &= \frac{5}{12} \end{aligned}$$

10. The shaded area is half the area of the triangle, so the probability is $\frac{1}{2}$, or 50%.

11. The shaded area is $\frac{1}{4}+\frac{1}{2}\cdot\frac{1}{4}=\frac{3}{8}$, so the probability of hitting the shaded area is $\frac{3}{8}$, or 37.5%.

12. $\frac{60}{360}=\frac{1}{6}$ of the circle is shaded, so the probability is $\frac{1}{6}$, or about 16.7%.

13. The shaded area is half the area of the square, so the probability is $\frac{1}{2}$, or 50%.

14. The shaded area is half the area of the parallelogram, so the probability is $\frac{1}{2}$, or 50%.

15. $$\begin{aligned} 5! &= 5\cdot4\cdot3\cdot2\cdot1 \\ &= 120 \end{aligned}$$

16. $$\begin{aligned} 8! &= 8\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1 \\ &= 40{,}320 \end{aligned}$$

17. $$\begin{aligned} \frac{7!}{3!} &= \frac{7\cdot6\cdot5\cdot4\cdot3!}{3!} \\ &= 7\cdot6\cdot5\cdot4 \\ &= 840 \end{aligned}$$

18. $$\begin{aligned} \frac{12!}{9!3!} &= \frac{12\cdot11\cdot10\cdot9!}{9!3!} \\ &= \frac{12\cdot11\cdot10}{3!} \\ &= \frac{12\cdot11\cdot10}{3\cdot2\cdot1} \\ &= 220 \end{aligned}$$

19.
$$
\begin{aligned}
{}_8P_5 &= \frac{8!}{(8-5)!} \\
&= \frac{8!}{3!} \\
&= \frac{8\cdot7\cdot6\cdot5\cdot4\cdot3!}{3!} \\
&= 8\cdot7\cdot6\cdot5\cdot4 \\
&= 6720
\end{aligned}
$$

20.
$$
\begin{aligned}
{}_{10}P_2 &= \frac{10!}{(10-2)!} \\
&= \frac{10!}{8!} \\
&= \frac{10\cdot9\cdot8!}{8!} \\
&= 10\cdot9 \\
&= 90
\end{aligned}
$$

21.
$$
\begin{aligned}
{}_9C_7 &= \frac{9!}{7!(9-7)!} \\
&= \frac{9!}{7!2!} \\
&= \frac{9\cdot8\cdot7!}{7!2!} \\
&= \frac{9\cdot8}{2!} \\
&= \frac{9\cdot8}{2\cdot1} \\
&= 36
\end{aligned}
$$

22.
$$
\begin{aligned}
{}_{20}C_3 &= \frac{20!}{3!(20-3)!} \\
&= \frac{20!}{3!17!} \\
&= \frac{20\cdot19\cdot18\cdot17!}{3!17!} \\
&= \frac{20\cdot19\cdot18}{3!} \\
&= \frac{20\cdot19\cdot18}{3\cdot2\cdot1} \\
&= 1140
\end{aligned}
$$

23. Use the Fundamental Counting Principle:
$26\cdot25\cdot24\cdot10\cdot9\cdot8\cdot7 = 78{,}624{,}000$

24. Use a combination, ${}_{n}C_{r} = \dfrac{n!}{r!(n-r)!}$ with $n = 25$ and $r = 3$:

$$
\begin{aligned}
{}_{25}C_{3} &= \frac{25!}{3!(25-3)!} \\
&= \frac{25!}{3!22!} \\
&= \frac{25 \cdot 24 \cdot 23 \cdot 22!}{3!22!} \\
&= \frac{25 \cdot 24 \cdot 23}{3!} \\
&= \frac{25 \cdot 24 \cdot 23}{3 \cdot 2 \cdot 1} \\
&= 2300
\end{aligned}
$$

25.
$$
\begin{aligned}
P(A \text{ and } B) &= P(A) \cdot P(B) \\
&= 0.46 \cdot 0.25 \\
&= 0.115
\end{aligned}
$$

26.
$$
\begin{aligned}
P(A \text{ or } B) &= P(A) + P(B) - P(A \text{ and } B) \\
&= P(A) + P(B) - [P(A) \cdot P(B)] \\
&= 0.46 + 0.25 - (0.46 \cdot 0.25) \\
&= 0.71 - 0.115 \\
&= 0.595
\end{aligned}
$$

27.
$$
\begin{aligned}
P(\text{red or green}) &= P(\text{red}) + P(\text{green}) \\
&= \frac{3}{16} + \frac{4}{16} \\
&= \frac{7}{16}
\end{aligned}
$$

28. Answers may vary. Sample:
If the events are mutually exclusive, then $P(A \text{ and } B) = 0$ and the formula becomes $P(A \text{ or } B) = P(A) + P(B)$. Otherwise, the formula is used as stated.

29. 11 students did not study, and 7 of those students passed. The probability is $P(\text{passed} \mid \text{did not study}) = \frac{7}{11}$.

30. 20 students studied, and 19 of those students passed. The probability is
$P(\text{passed} \mid \text{studied}) = \frac{19}{20} = 0.95$.

31. 26 students passed, and 19 of those students studied. The probability is

$P(\text{studied}|\text{passed}) = \frac{19}{26}$.

32.
$$\begin{aligned} P(\text{both b-ball}) &= P(\text{b-ball on 1st}) \cdot P\begin{pmatrix}\text{b-ball on 2nd,} \\ \text{given b-ball on 1st}\end{pmatrix} \\ &= \frac{12}{30} \cdot \frac{11}{29} \\ &= \frac{22}{145} \end{aligned}$$

33.
$$\begin{aligned} P(\text{passed 2nd}|\text{passed 1st}) &= \frac{P(\text{passed both})}{P(\text{passed 1st})} \\ &= \frac{0.5}{0.7} \\ &= \frac{5}{7} \text{ or about } 71.4\% \end{aligned}$$

34.
$$\begin{aligned} P(\text{bought acc}|\text{bought shoes}) &= \frac{P(\text{bought both})}{P(\text{bought shoes})} \\ &= \frac{0.55}{0.74} \\ &= \frac{55}{74} \text{ or about } 74.3\% \end{aligned}$$