1. In Lesson 14.1 you compared the quality of two brands of paper clips. For that type of test, suppose 20% of Brand A clips and 45% of Brand B are defective. Also suppose 100 Brand A clips and 150 Brand B clips are mixed together and a randomly selected clip is tested.
   a. What is the probability that the selected clip is Brand A and it breaks?
   b. What is the probability that the selected clip is Brand B and it breaks?
   c. What is the total probability that the selected paper clip breaks?

1a) P(Brand A and breaks)

$= P(A) \cdot P(\text{breaks}|A)$

$= \dfrac{100}{250} \cdot \dfrac{20}{100} \cdot .20$

$= \dfrac{2}{25}$ or .08 or 8%

b) P(Brand B and breaks)

$= P(B) \cdot P(\text{breaks}|B)$

$= \dfrac{150}{250} \cdot \dfrac{45}{100} \cdot .45$

$= \dfrac{27}{100}$ or .27 or 27%

c) P(breaks)

$= P(A \text{ and breaks}) + P(B \text{ and breaks})$

$= 8\% + 27\%$

$= 35\%$ or .35

For Exercises 2 and 3, determine whether the two events are independent or dependent and then find the probability.

2. A coin purse contains 3 dimes, 2 pennies, and 4 quarters. What is the probability of selecting a penny, then a dime, and then a quarter, if the coins are not replaced? Total = 9

3. What is the probability of rolling a number cube, labeled 1–6, four times and rolling a 3 each time?

2) Dependent

P(P then D then Q) = $\dfrac{2}{9} \cdot \dfrac{3}{8} \cdot \dfrac{4}{7}$
w/o replacement

$= \dfrac{1}{21}$

3) Independent

P(3 and 3 and 3 and 3) $= \dfrac{1}{6} \cdot \dfrac{1}{6} \cdot \dfrac{1}{6} \cdot \dfrac{1}{6}$

$= \left(\dfrac{1}{6}\right)^4$

$= \dfrac{1}{1,296}$

4. A box contains 50 tiles with shapes drawn on them. In addition to other shapes, there are 2 squares, 5 circles, and 3 triangles in the box.
   a. Find the probability of drawing two circles if you replace the first before drawing the second.
   b. Find the probability of drawing two circles without replacing the first circle.
   c. Find the probability of drawing a square followed by a triangle with replacement.
   d. Find the probability of drawing a square followed by a triangle without replacement.

4)a) P(O and O) = $\dfrac{5}{50} \cdot \dfrac{5}{50}$
w/ replace.

$= \dfrac{1}{10} \cdot \dfrac{1}{10}$

$= \dfrac{1}{100}$

b) P(O and O) = $\dfrac{5}{50} \cdot \dfrac{4}{49}$
w/o replace.

$= \dfrac{1}{10} \cdot \dfrac{4}{49}$

$= \dfrac{2}{245}$

c) P(□ and △) = $\dfrac{2}{50} \cdot \dfrac{3}{50}$
w/ replace

$= \dfrac{1}{25} \cdot \dfrac{3}{50}$

$= \dfrac{3}{1,250}$

d) P(□ and △) = $\dfrac{2}{50} \cdot \dfrac{3}{49}$
w/o replace.

$= \dfrac{1}{25} \cdot \dfrac{3}{49}$

$= \dfrac{3}{1,225}$

5. A number cube, labeled 1–6, is rolled 4 times, and it lands on 6 each time. What is the probability that the next roll will be a 6? Explain.

5) $\dfrac{1}{6}$; This is an independent event so the probability of rolling a 6 does not depend on the previous events.

6. In a deck of 20 cards, numbered 1–20, what is the probability of drawing a 3 or an even number?
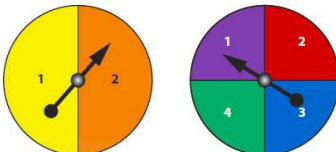
6) P(3 or even #) = P(3) + P(even #)

$= \dfrac{1}{20} + \dfrac{10}{20}$

$= \dfrac{11}{20}$

7. Two spinners are spun at the same time.

What is the probability that the sum of the numbers on the spinners will be 3?

7) spins are independent of each other, so...

P(spin 1) · P(spin 2 if 1st spin was 1) + P(spin 2) · P(spin 1 if 1st was 2)

$\dfrac{1}{2} \cdot \dfrac{1}{4} + \dfrac{1}{2} \cdot \dfrac{1}{4}$

$\dfrac{1}{8} + \dfrac{1}{8}$

$\dfrac{2}{?}$

What is the probability that the sum of the numbers on the spinners will be 3?

$\frac{1}{8} + \frac{1}{8}$

$\frac{2}{8}$

$\boxed{\frac{1}{4}}$

8. A quality control inspector checks flat-panel televisions for defects. The table below shows the probabilities of different numbers of defects.

Number of Defects Observed	0	1	2	3	4	5	6	7	8	9 or more
Probability	0.11	0.03	0.07	0.18	0.23	0.16	0.09	0.06	0.04	0.03

⭐ **a.** What is the probability that a television has fewer than three defects? $\boxed{\text{OR}}$

b. What is the probability that a television has at least five and no more than eight defects?

8a) $P(<3) = P(0 \text{ or } 1 \text{ or } 2)$
$= .11 + .03 + .07 = .21$

8b) $P(\geq 5 \text{ and} \leq 8) = P(5 \text{ or } 6 \text{ or } 7 \text{ or } 8)$
$= .16 + .09 + .06 + .04$
$= \boxed{.35}$

9. The probabilities of a randomly selected blood sample in the New York Blood Center being type O, type A, type B, or type AB are 0.45, 0.40, 0.10 and 0.05, respectively. What is the probability that a sample is either type A or type B?

⑨ $P(\text{Type A or Type B}) = .40 + .10$
$= \boxed{.50}$

10. A student takes a ten-question, multiple-choice test. Each question has five answer choices.

a. If the student guesses each answer, what is the probability that the student will get all of the questions wrong?

b. What is the probability that the student will get all of the questions correct?

10 a) $P(\text{all wrong}) = \left(\frac{4}{5}\right)^{10}$ or $\approx \boxed{.107}$

↑ getting 1 wrong

10 b) $P(\text{all right}) = \left(\frac{1}{5}\right)^{10}$ or $\approx \boxed{.0000001 02}$ Woah!!!

↑ getting 1 correct

11. A dart is thrown at the target shown below.
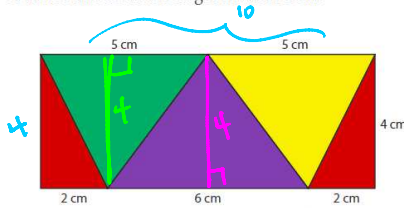
a. If the dart hits the target at a random location, what is the probability that it will land in a red triangle?

b. What is the probability that it will land in a green or a purple region?

11a) Area of 2 red $\triangle$'s $= 2 \cdot \left(\frac{2 \cdot 4}{2}\right)$
$= 8 \text{ cm}^2$
Area of $\square = 10 \cdot 4 = 40 \text{ cm}^2$
$P(\text{red } \triangle) = \frac{8}{40} = \boxed{\frac{1}{5}}$

11 b) $A_{\text{Green } \triangle} = \frac{5 \cdot 4}{2}$ $A_{\text{Purple } \triangle} = \frac{6 \cdot 4}{2}$
$= 10 \text{ cm}^2$ $= 12 \text{ cm}^2$

$P(\text{Green or Purple}) = \frac{10}{40} + \frac{12}{40}$
$= \frac{22}{40}$
$= \frac{11}{20}$

12. The fuel pumps used by Boeing were thought to have a 3% chance of having faulty wiring. Consider an airplane with two such pumps.

a. What is the probability that both pumps are faulty?

b. What is the probability that neither pump is faulty?

c. What is the probability that exactly one of the pumps is faulty?

$P(\text{faulty}) = .03$
$P(\sim\text{faulty}) = 1 - .03 = .97$

12a) $P(\text{faulty and faulty}) = .03 * .03 = .0009$

b) $P(\sim\text{faulty and} \sim\text{faulty}) = .97 * .97 = .9409$

c) $P(1 \text{ faulty and } 2 \sim\text{faulty})$ or $P(1\sim\text{faulty and } 2 \text{ faulty})$
$= .03 * .97 + .97 * .03$
$= .0291 + .0291$
$= .0582$

$\boxed{\text{OR}}$ $P(1 \text{ Pump faulty}) = 1 - [P(F) \text{ or } P(\sim F)]$
$= 1 - (.0009 + .9409)$
$= .0582$

13. A company that makes refrigerator ice-making units has a 4% defect rate. What is the probability that an inspector might examine a sample of five randomly selected units and find no defects in the sample?

13) $P(\text{no defects}) = (.96)^5$ or $\approx .815$

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$4\% = $ Def

$96\% = $ not def

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