

①

(a) 10 10 10 10 26 26 26 3 3

$$10^4 \cdot 26^3 \cdot 3^2 =$$

$$1,581,840,000$$

(b)

French English
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3 ways

multiply by permutations
of the books

$$3 \cdot 2! \cdot 5! = 720$$

② (a)

$$S = \{ (H, H, H), (H, H, T), (H, T, H), (H, T, T), \\ (T, H, H), (T, H, T), (T, T, H), (T, T, T) \}$$

(b)

$$E = \{ (H, T, T), (T, H, T), (T, T, H), (T, T, T) \}$$

$$F = \{ (H, T, T), (T, H, T), (T, T, H) \}$$

$$E \cap F = \{ (H, T, T), (T, H, T), (T, T, H) \}$$

$$E \cup F = \{ (H, T, T), (T, H, T), (T, T, H), (T, T, T) \}$$

$$\bar{F} = \{ (H, H, H), (H, H, T), (H, T, H), (T, H, H), \\ (T, T, T) \}$$

$$(c) \quad P(E) = \frac{4}{8} = \frac{1}{2}$$

$$P(F) = \frac{3}{8}$$

③

(a) $6^5 = 7,776$

(b)

Pick where
the 3's go

$$\binom{5}{2} = \frac{5 \cdot 4}{2} = 10$$

Now fill in
the remaining
3 spots

$$5 \cdot 5 \cdot 5 = 5^3$$

$$\text{Answer} = \frac{10 \cdot 5^3}{6^5} =$$

$$\frac{1250}{7776}$$

 4 4

not 4 4 not not
4 4 4

(c) We list all the possibilities

1 1 1 1 1

← sum is 5

2 1 1 1 1

1 2 1 1 1

1 1 2 1 1

1 1 1 2 1

1 1 1 1 2

sum is 6

probability is

$$\frac{6}{7776}$$

④

$$(a) \binom{52}{6} = \frac{52!}{46!6!} = \frac{52 \cdot 51 \cdot 50 \cdot 49 \cdot 48 \cdot 47}{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2}$$

$$= \frac{14,658,134,400}{720}$$

$$= 20,358,520$$

(b)

choose suit ↓ pick 6 cards from chosen suit ↓

$$\frac{4 \cdot \binom{13}{6}}{\binom{52}{6}} = \frac{4 \cdot \frac{13 \cdot 12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7}{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2}}{20,358,520}$$

$$= \frac{4(1716)}{20,358,520} = \frac{6864}{20,358,520}$$

$$\approx 0.00033716\dots$$

$$\approx 0.03\%$$

⑤

(a)

$$\frac{\binom{3}{1} \binom{3}{1} \binom{4}{2}}{\binom{10}{4}} = \frac{3 \cdot 3 \cdot 6}{\frac{10 \cdot 9 \cdot 8 \cdot 7}{4 \cdot 3 \cdot 2 \cdot 1}} = \boxed{\frac{54}{210}}$$

$$\approx 0.257$$

(b)

$$\frac{\binom{5}{2}}{\binom{10}{2}} = \frac{\frac{5 \cdot 4}{2}}{\frac{10 \cdot 9}{2}} = \frac{10}{45}$$

$$= \boxed{\frac{2}{9}}$$

$$\approx 0.22$$