224.

Broj kombinacija trećeg razreda s ponavljanjem elemenata

$$K_r(n)=\binom{n+r-1}{r}$$

$$r=3$$

$$K_3(n)=\binom{n+3-1}{3}$$

Broj varijacija trećeg razreda bez ponavljanja elemenata

$$V_r(n)=\binom{n}{r}\cdot r!=\frac{n!}{(n-r)!}$$

$$r=3$$

$$V_3(n)=\frac{n!}{(n-3)!}$$

$$\binom{n+3-1}{3}:\frac{n!}{(n-3)!}=539:3040$$

$$\binom{n+3-1}{3}:\frac{n!}{(n-3)!}=\binom{n+2}{3}:\frac{(n-3)!\cdot(n-2)\cdot(n-1)\cdot n}{(n-3)!}=\frac{(n+2)!}{(n+2-3)!\cdot 3!}:\frac{(n-2)\cdot(n-1)\cdot n}{1}=$$

$$=\frac{(n+2)!}{(n-1)!\cdot 3!}:\frac{(n-2)\cdot(n-1)\cdot n}{1}=$$

$$=\frac{(n-1)!\cdot n\cdot(n+1)\cdot(n+2)}{(n-1)!\cdot 3!}\cdot\frac{1}{(n-2)\cdot(n-1)\cdot n}=$$

$$=\frac{\cancel{n}\cdot(n+1)\cdot(n+2)}{1\cdot 2\cdot 3}\cdot\frac{1}{(n-2)\cdot(n-1)\cdot\cancel{n}}=$$

$$=\frac{(n+1)\cdot(n+2)}{6\cdot(n-2)\cdot(n-1)}=\frac{n^2+2n+n+2}{(6n-12)\cdot(n-1)}=\frac{n^2+3n+2}{6n^2-6n-12n+12}=\frac{n^2+3n+2}{6n^2-18n+12}$$

$$\binom{n+r-1}{r}:\frac{n!}{(n-r)!}=539:3040$$

$$\frac{n^2+3n+2}{6n^2-18n+12}=\frac{539}{3040}\quad /\cdot 3040\cdot\left(6n^2-18n+12\right)$$

$$3040\left(n^2+3n+2\right)=539\left(6n^2-18n+12\right)$$
$$3040n^2+9120n+6080=3234n^2-9702n+6468$$
$$3040n^2-3234n^2+9120n+9702n+6080-6468=0$$
$$-194n^2+18822n-388=0\quad /:(-2)$$
$$97n^2-9411n+194=0$$
$$n_{1,2}=\frac{9411\pm\sqrt{9411^2-4\cdot 97\cdot 194}}{2\cdot 97}=\frac{9411\pm\sqrt{88491649}}{194}=\frac{9411\pm 9407}{194}$$

$$n_1=\frac{9411+9407}{194}=\frac{18818}{194}=97 \qquad n_2=\frac{9411-9407}{194}=\frac{4}{194}=\frac{2}{97}$$

Kako n – mora biti cijeli broj, to je jedino rješenje

$n=97$