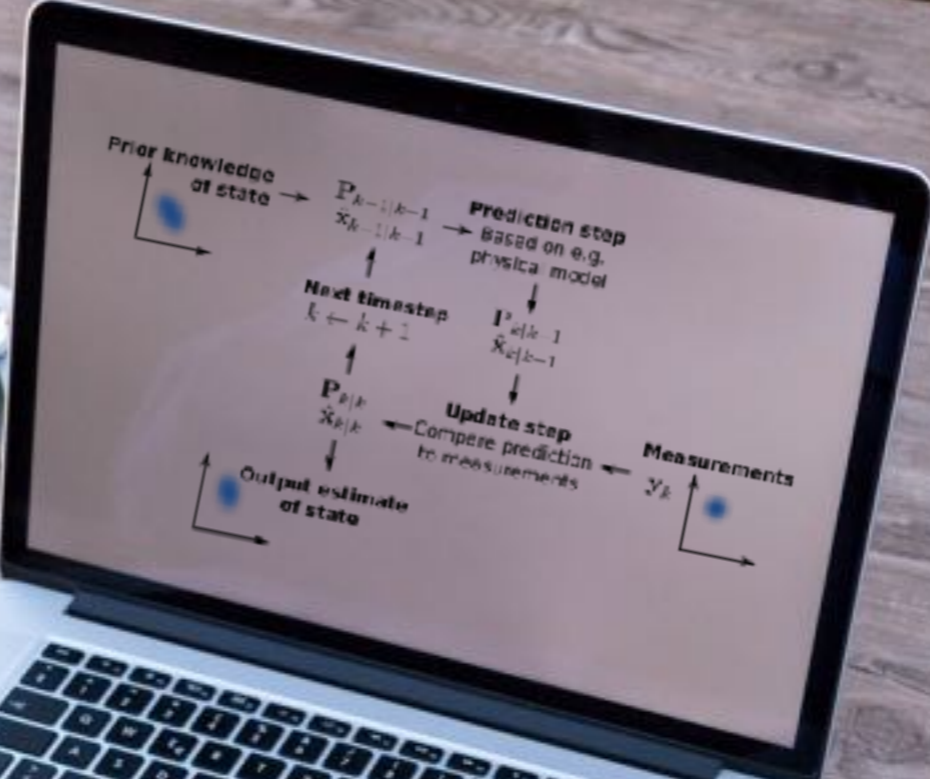


Xmas 4.0

Digitalization at North Pole

Maximilian Schwenger





- Renewable Energy
- Big Data
- $P \neq NP$
- Donald Trump
- Higgs-Boson
- Cancer
- Hybrid Systems
- Brexit
- Deep Learning
- Neural Protheses
- Infinite Precision
- Quantum Computing
- Terror in Manchester
- Distributed Synthesis
- Politics
- Prinz Harry's Engagement

- Big Data
- $P \neq NP$
- Cancer
- Hybrid Systems
- Deep Learning
- Neural Protheses
- Infinite Precision
- Quantum Computing
- Distributed Synthesis

- $P \neq NP$

- Infinite Precision

- Quantum Computing

- Distributed Synthesis

- Hybrid Systems

- $P \neq NP$

- Infinite Precision

- Quantum Computing

- Distributed Synthesis

- Hybrid Systems

- Hybrid Systems

- Quantum Computing







Elf; 30y/o; ~140cm/4.5ft

⇒ ~1500 kcal per day!



Elf; 30y/o; ~140cm/4.5ft

⇒ ~1500 kcal per day!



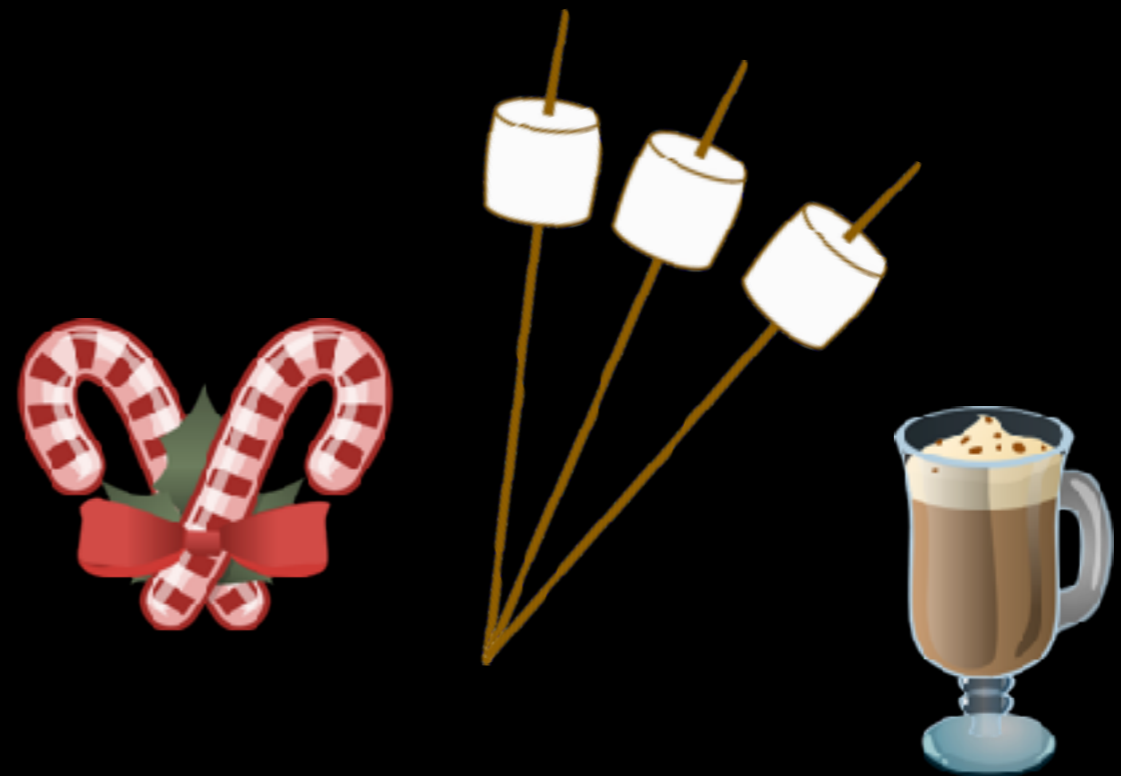
Elf; 30y/o; ~140cm/4.5ft

⇒ ~1500 kcal per day!



Elf; 30y/o; ~140cm/4.5ft

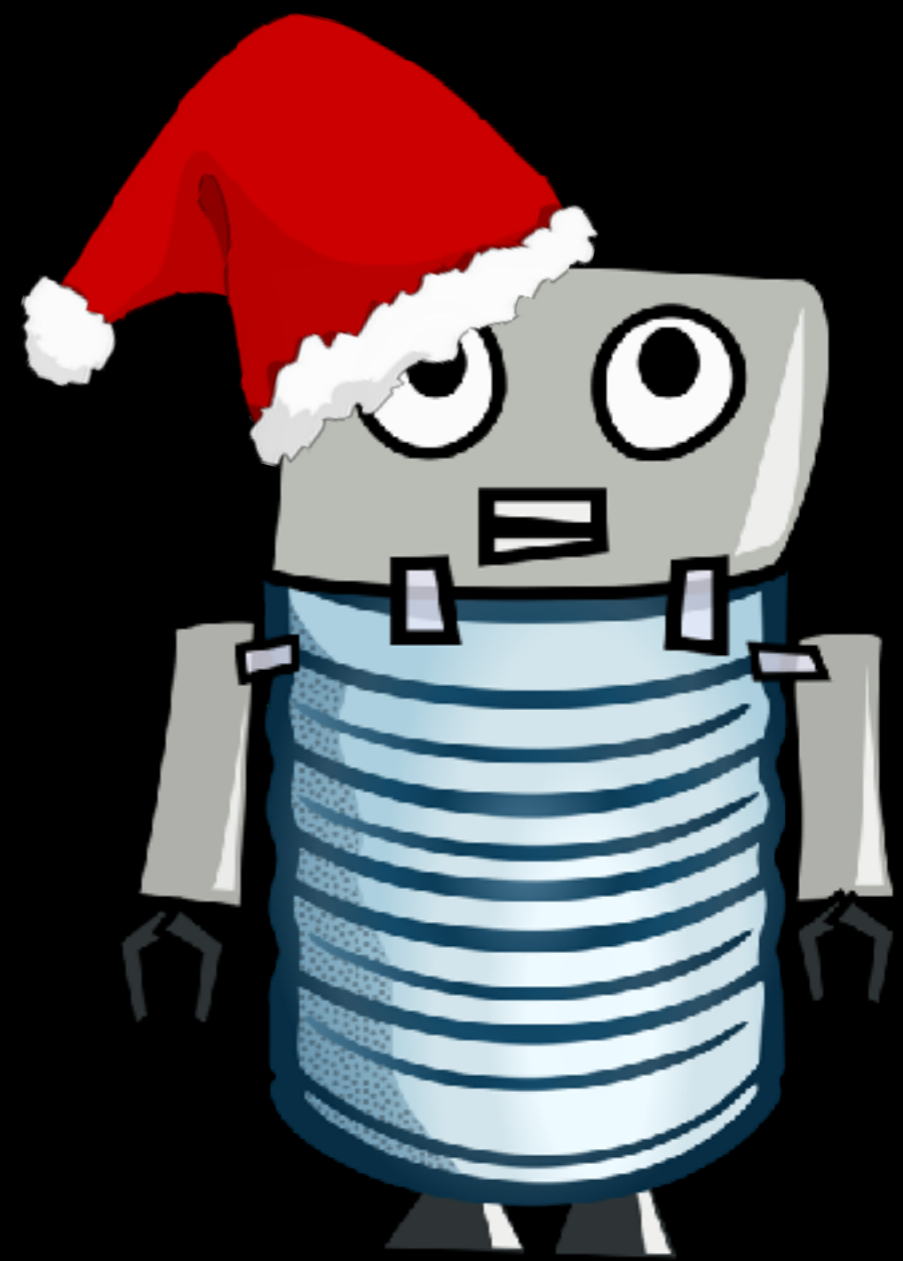
⇒ ~1500 kcal per day!

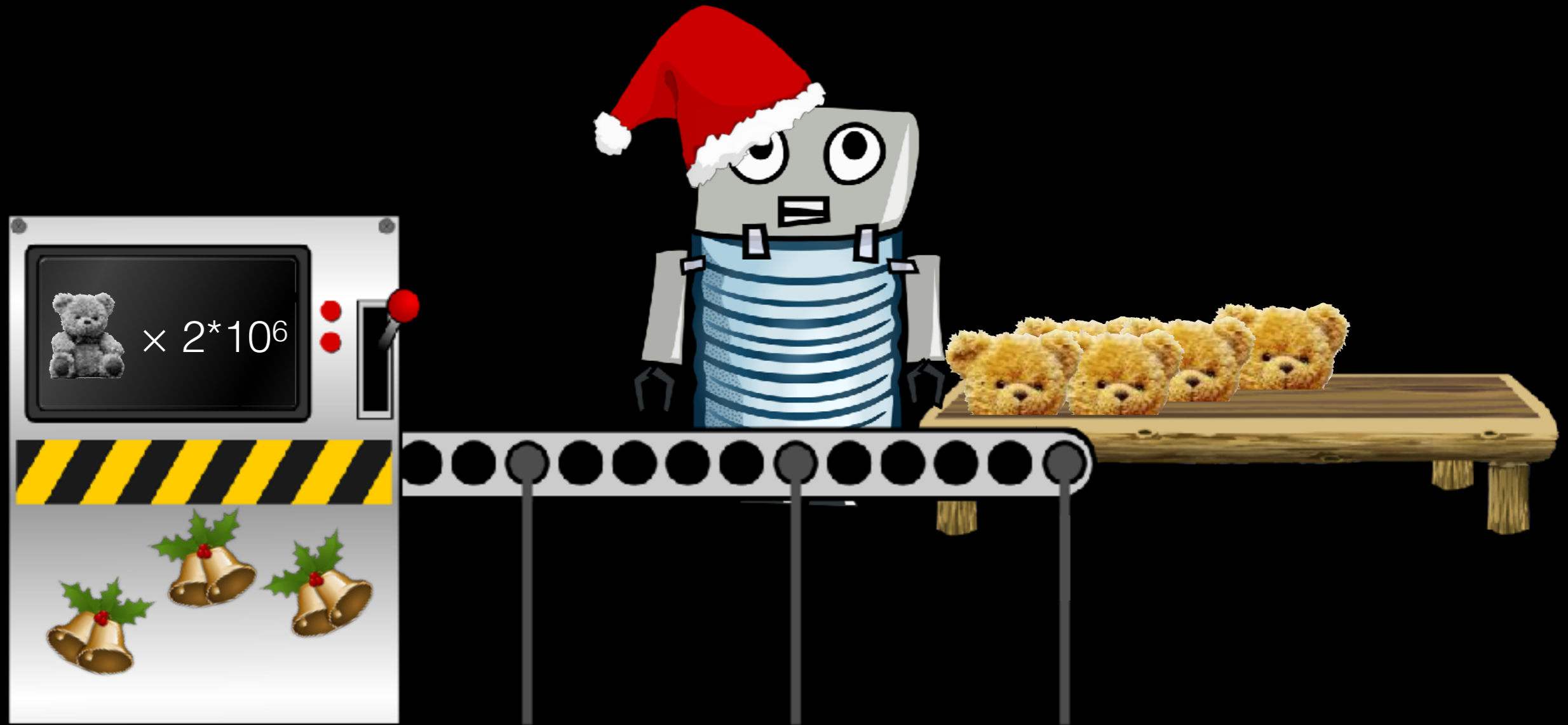


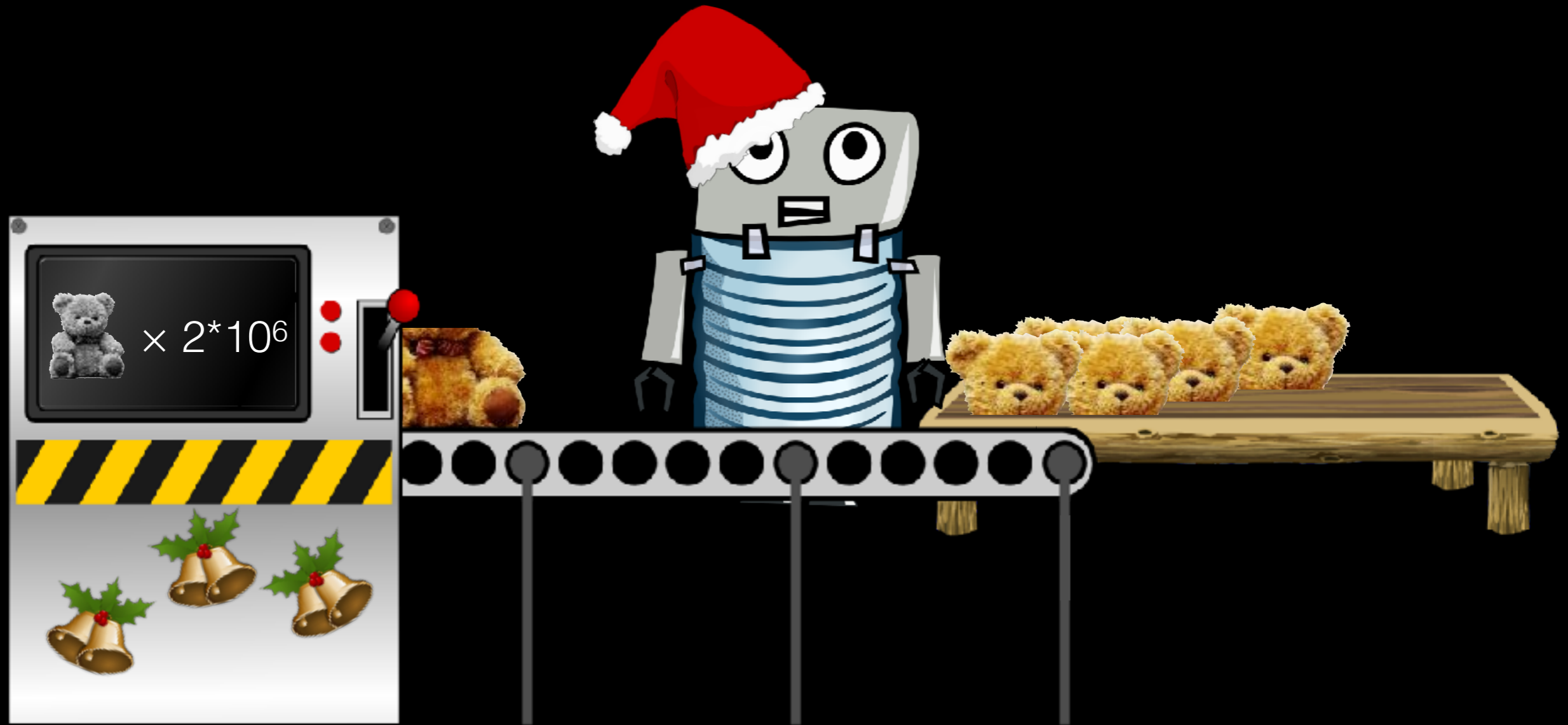
Elf; 30y/o; ~140cm/4.5ft

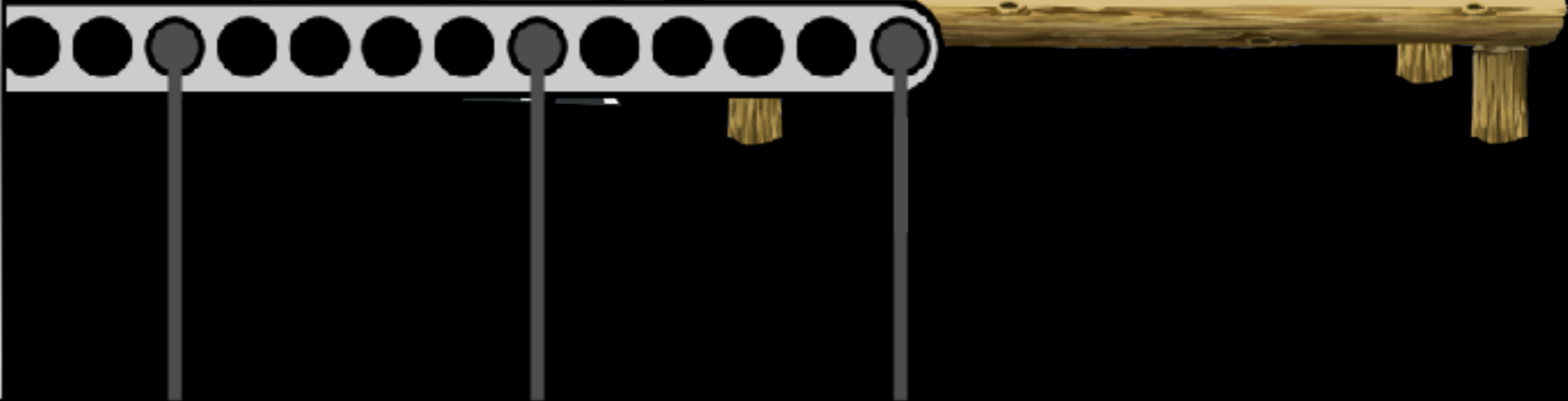
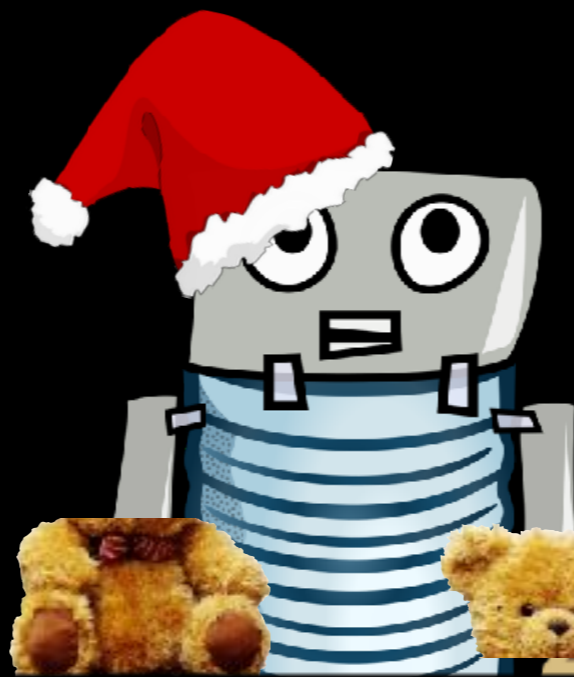
⇒ ~1500 kcal per day!

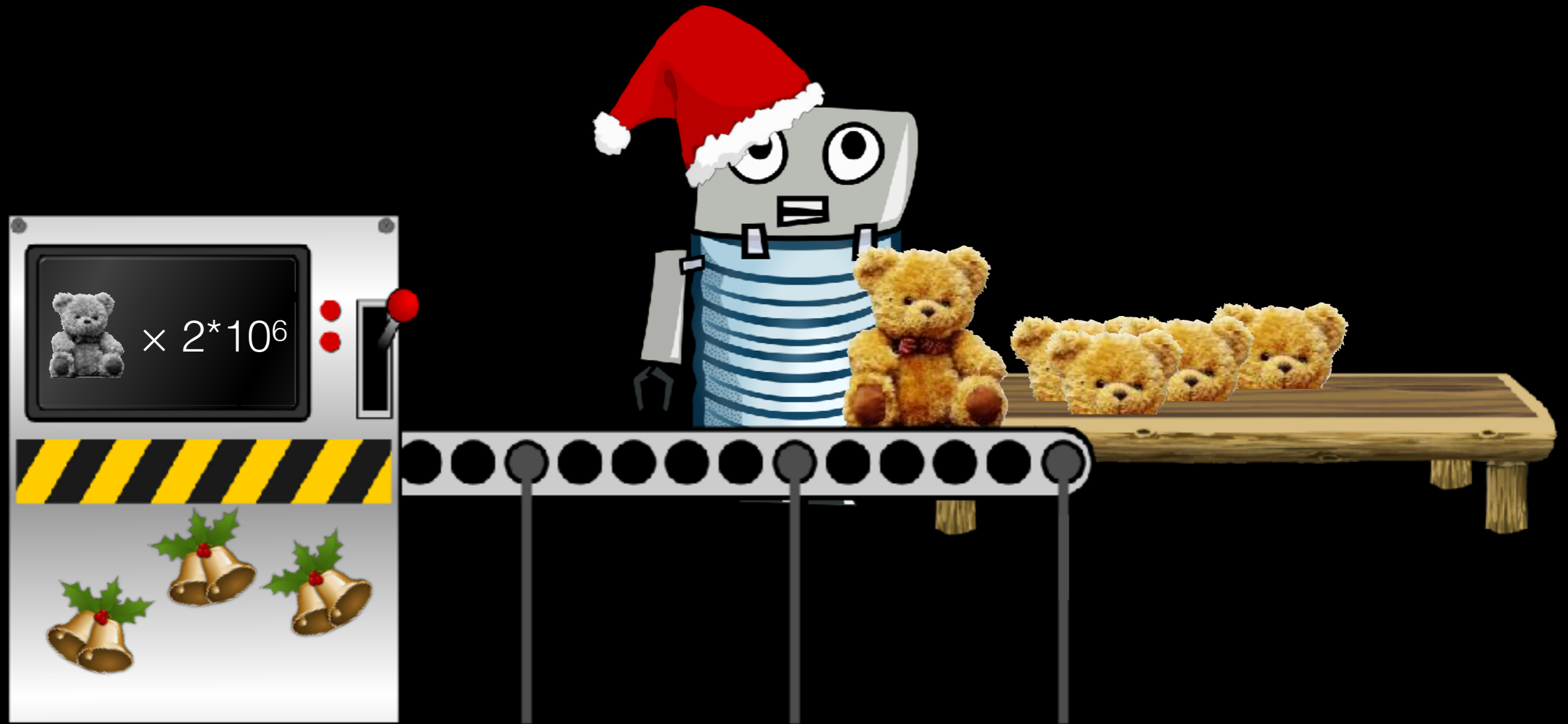








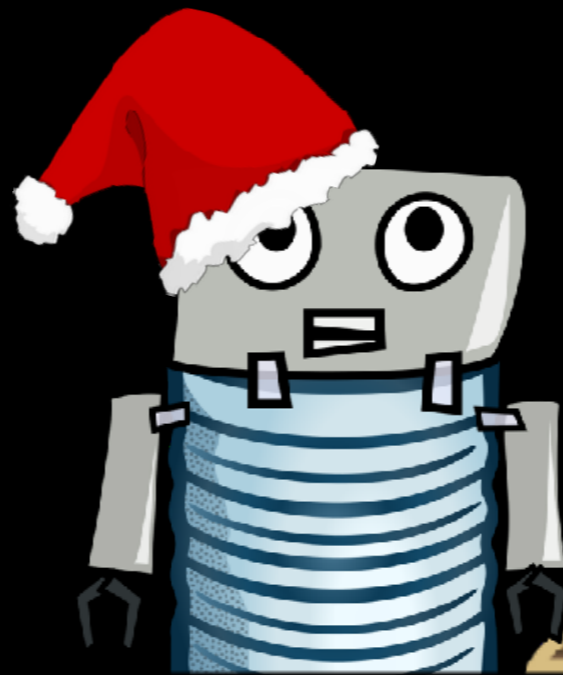




 $\times 2 \cdot 10^6$

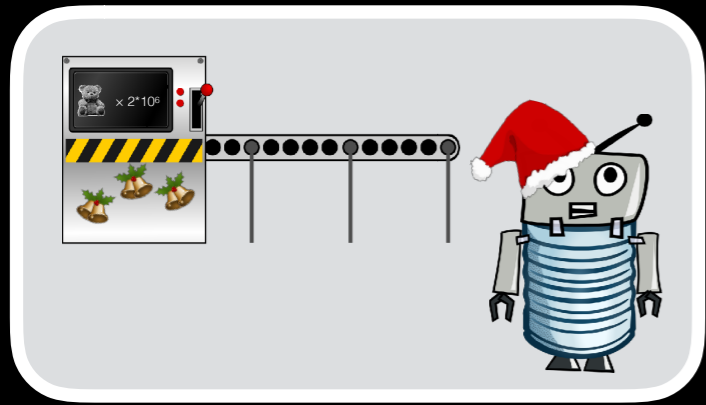


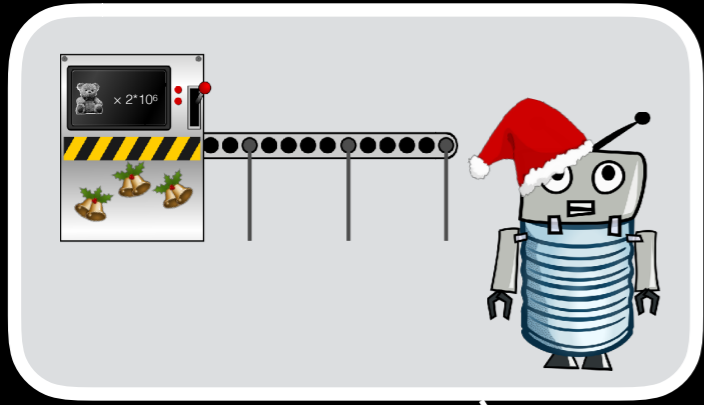




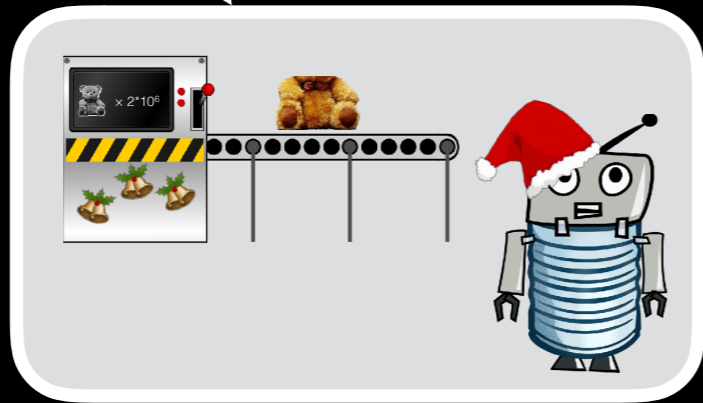


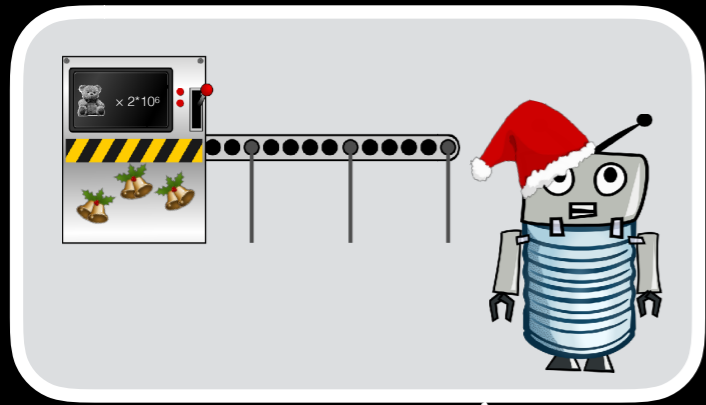
KEEP
CALM
AND
MATH
IT OUT





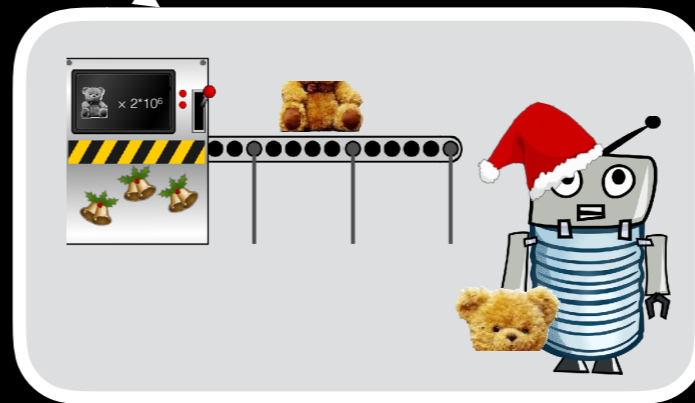
produce!

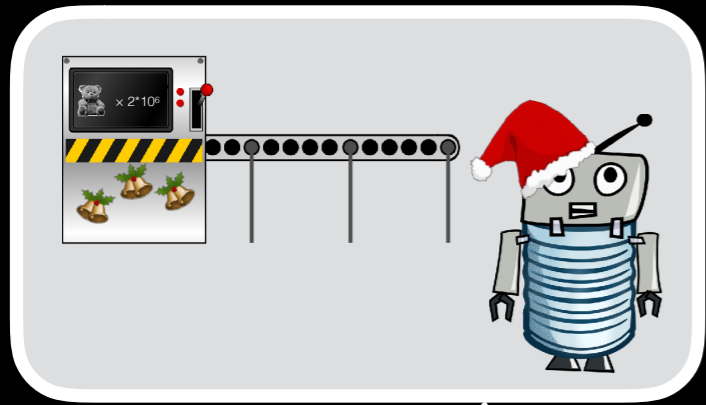




produce!

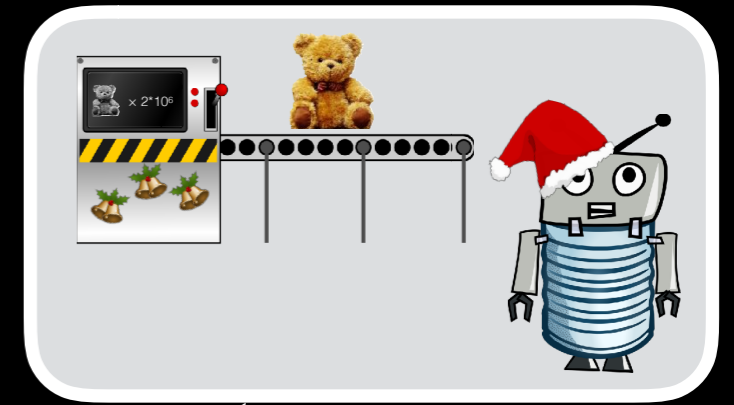
grab!



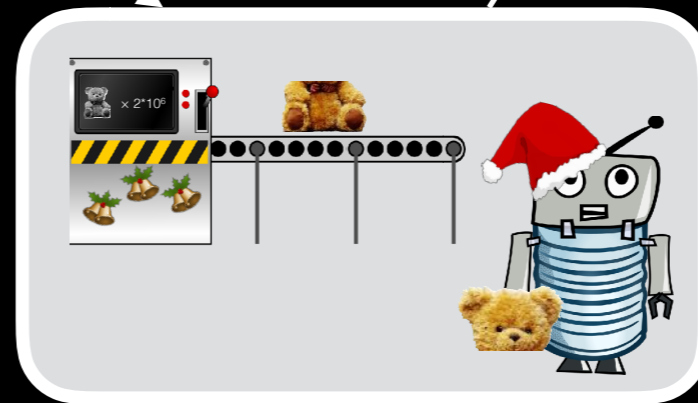


produce!

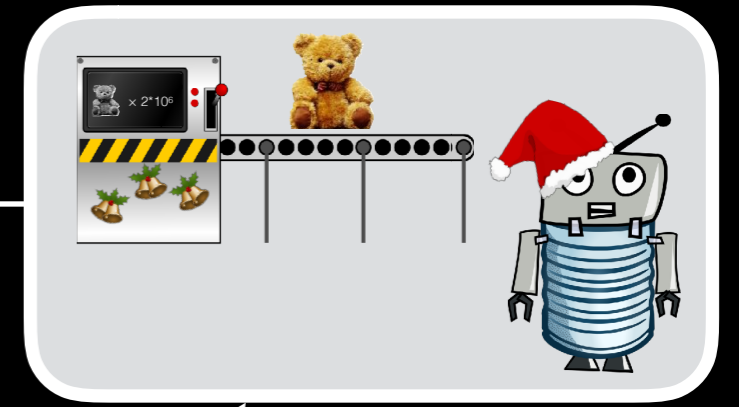
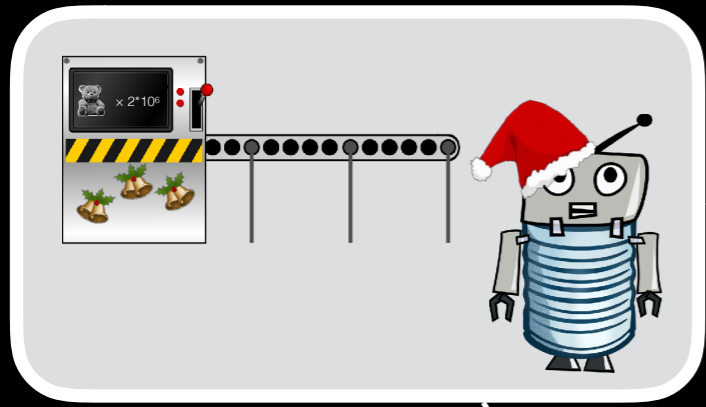
grab!



assemble!



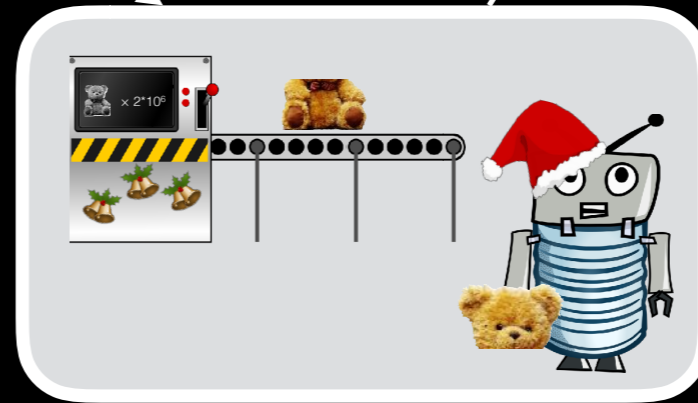
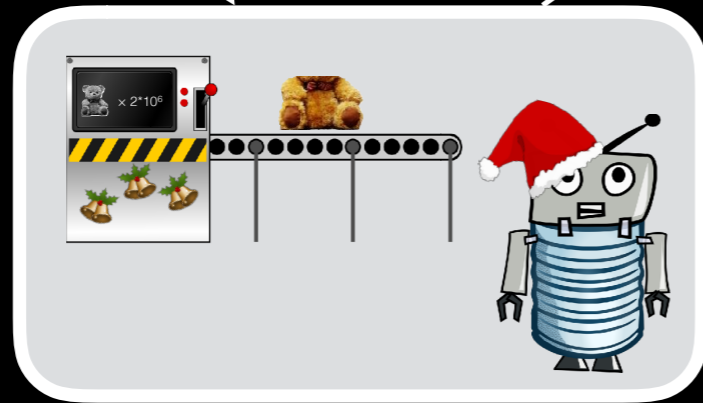
drop!

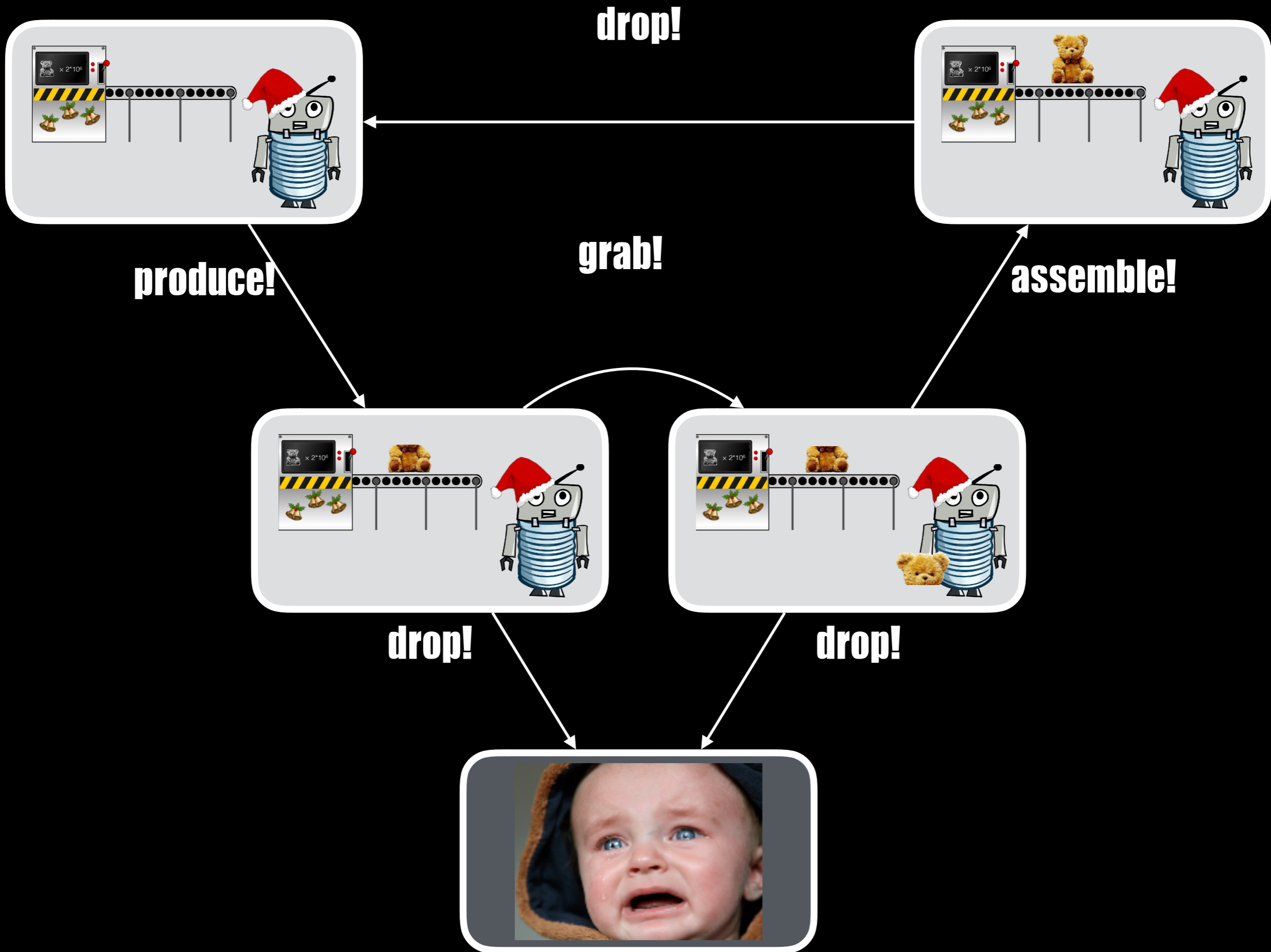


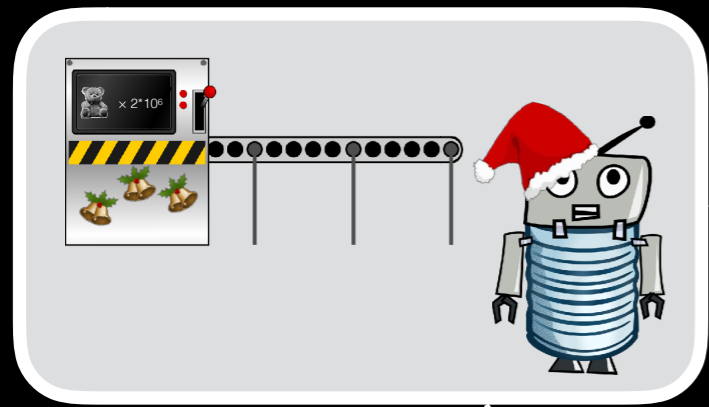
produce!

grab!

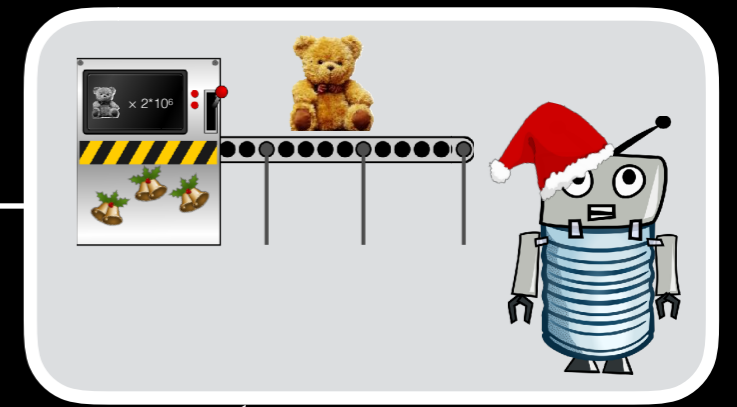
assemble!







drop!
line = 8

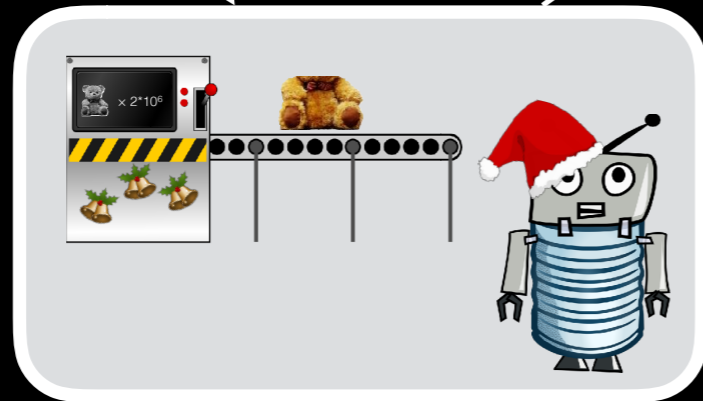


line \leq 8

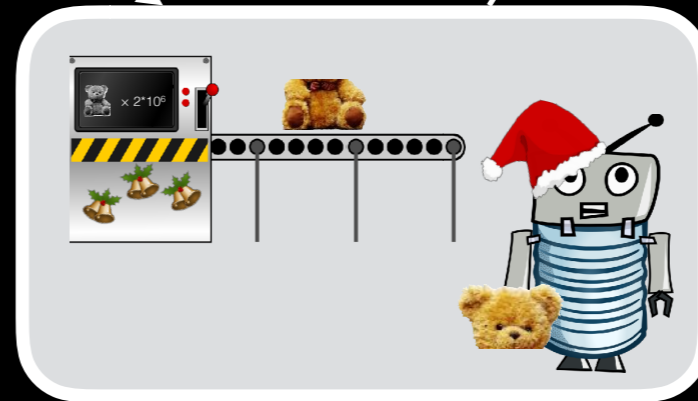
produce!

grab!

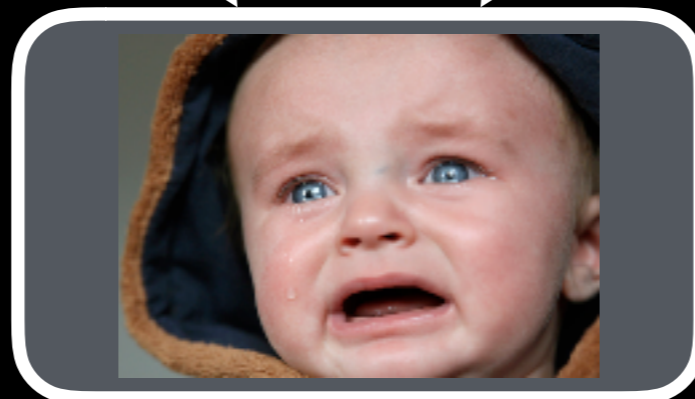
assemble!

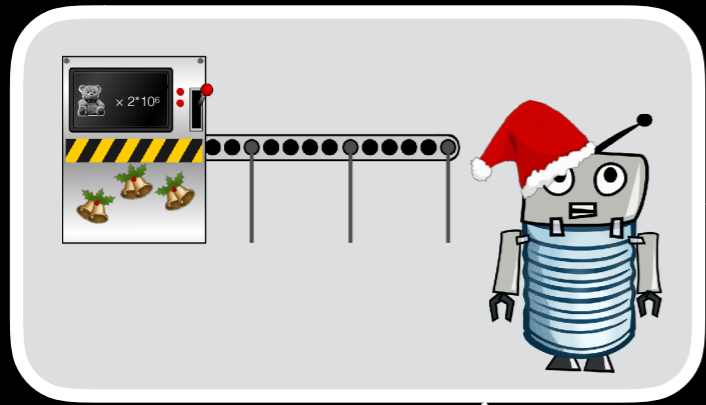


drop!
line = 8

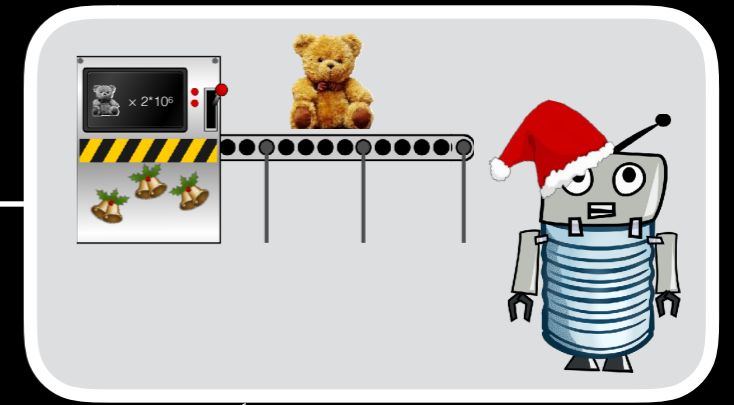


drop!
line = 8





drop!
line = 8

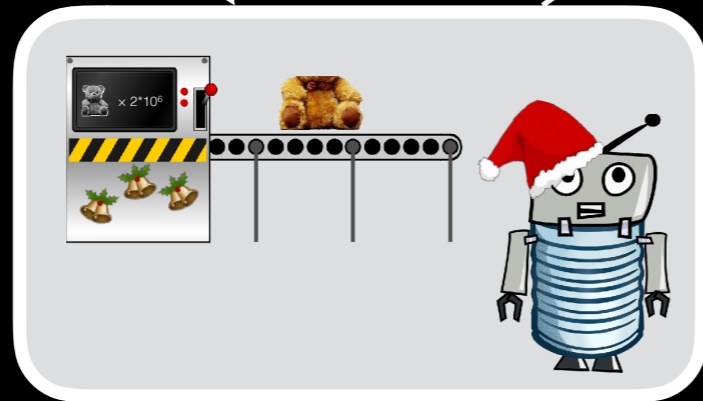


line \leq 8

produce!

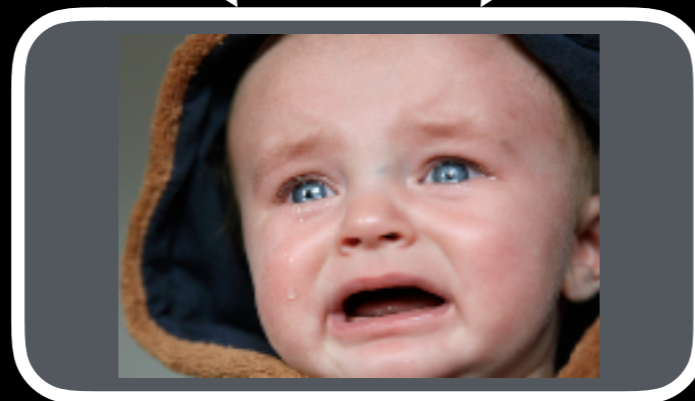
grab!
bot \geq 2

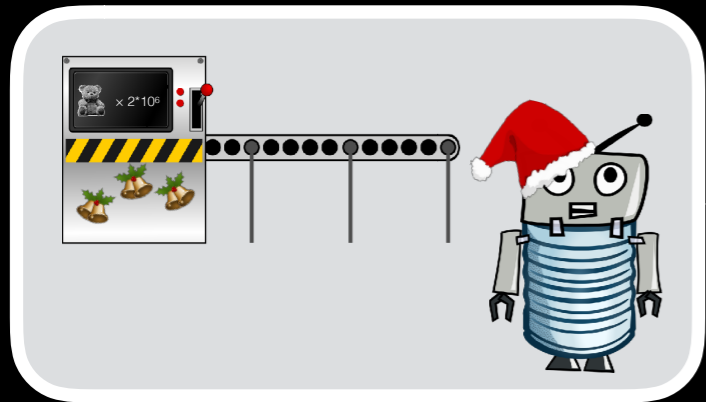
assemble!



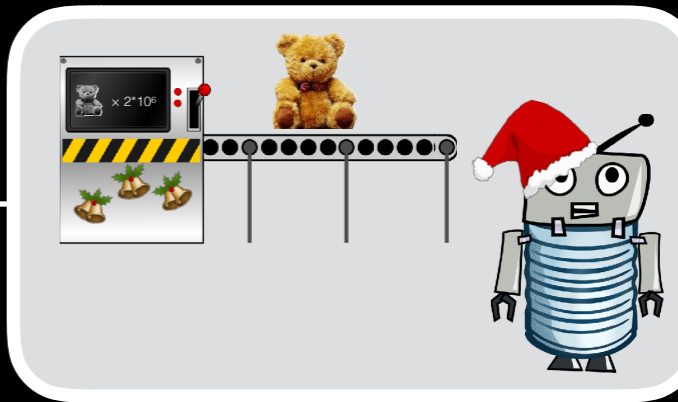
drop!
line = 8

drop!
line = 8





drop!
line = 8

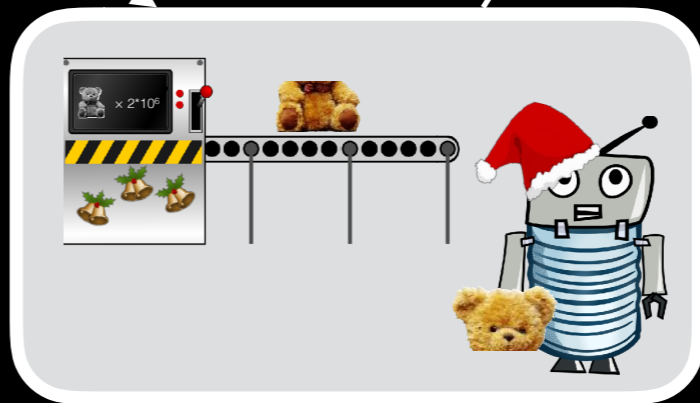


line \leq 8

produce!

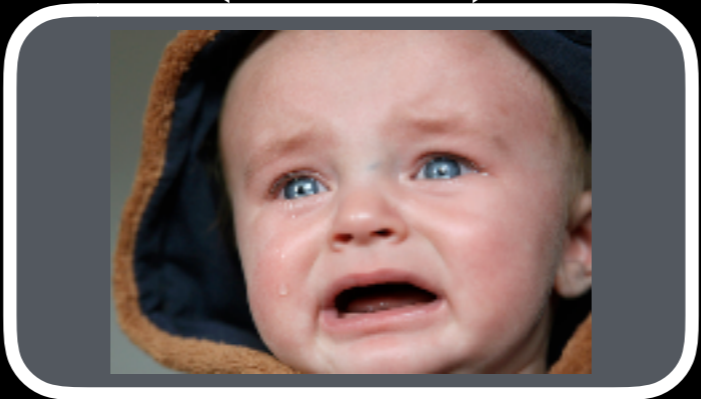
grab!
bot \geq 2

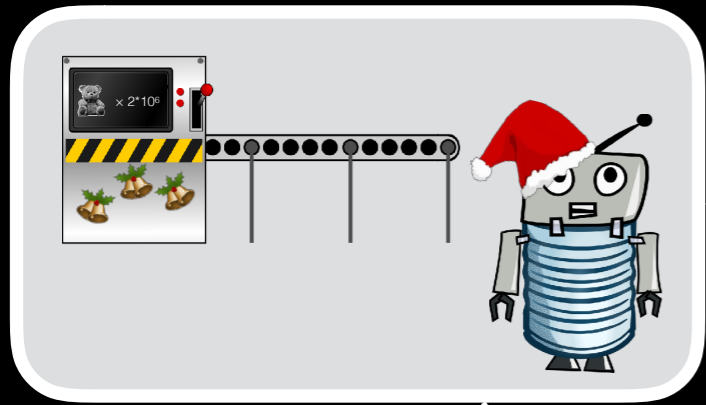
assemble!
bot \geq 3



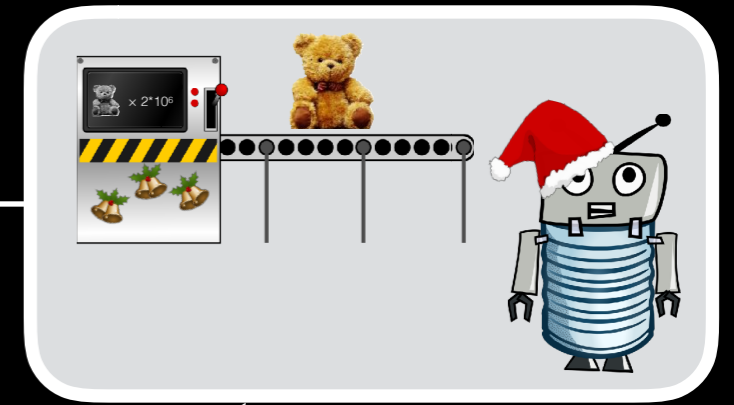
drop!
line = 8

drop!
line = 8





drop!
 $\text{line} = 8$

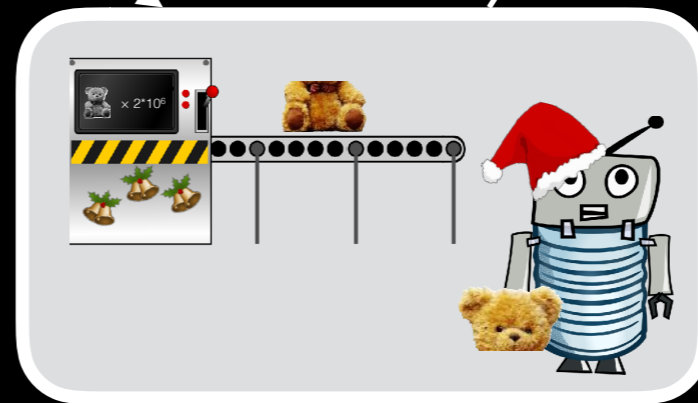
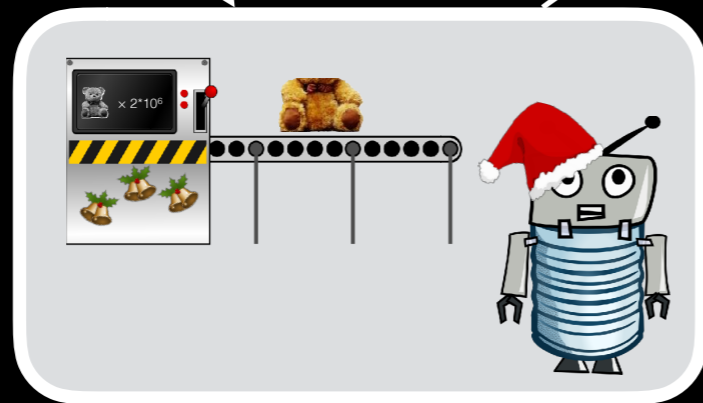


$\text{line} \leq 8$

produce!
 $\text{line} \triangleq 0$
 $\text{bot} \triangleq 0$

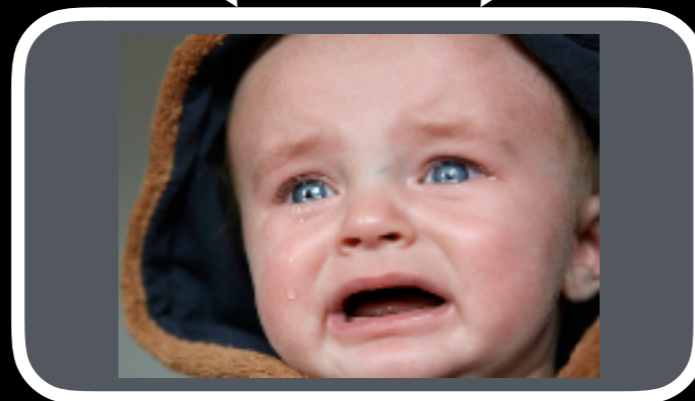
grab!
 $\text{bot} \geq 2$
 $\text{bot} \triangleq 0$

assemble!
 $\text{bot} \geq 3$



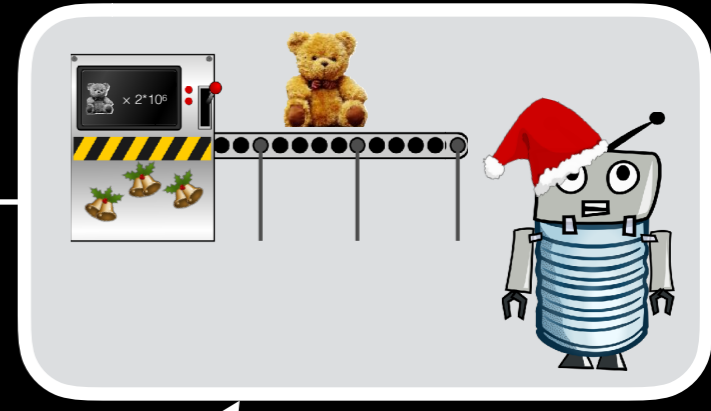
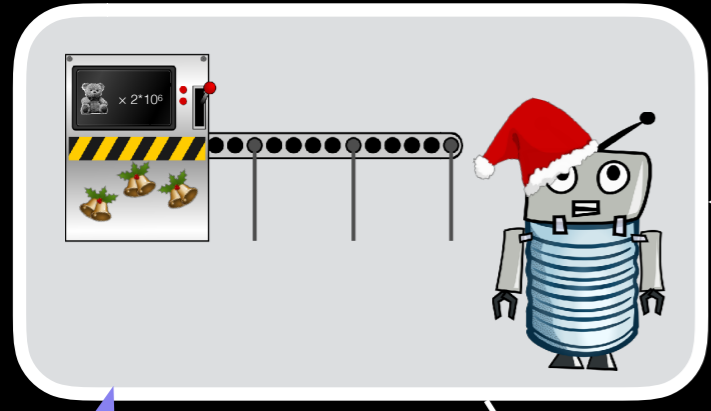
drop!
 $\text{line} = 8$

drop!
 $\text{line} = 8$



$line \leq 8$

drop!
 $line = 8$



produce!

$line \triangleq 0$
 $bot \triangleq 0$

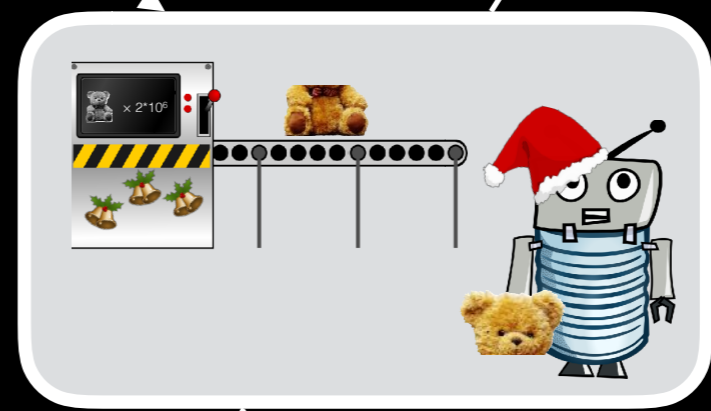
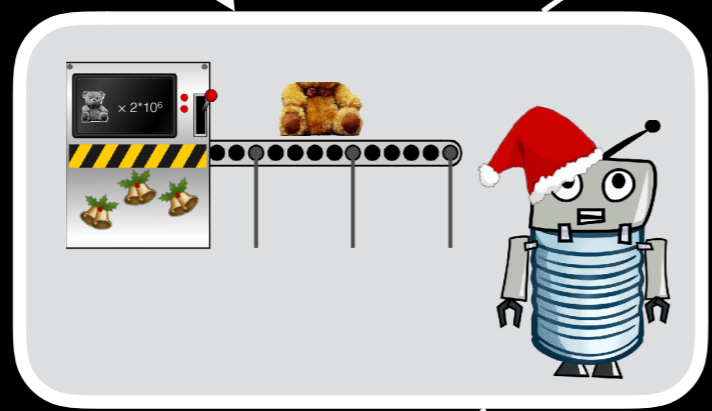
grab!

$bot \geq 2$
 $bot \triangleq 0$

assemble!

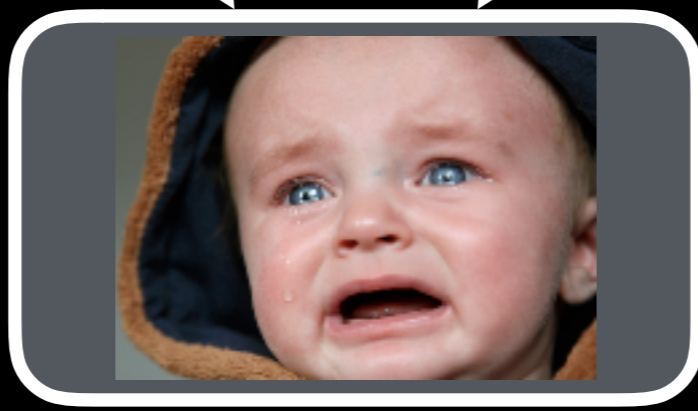
$bot \geq 3$

$line = 0$
 $bot = 0$



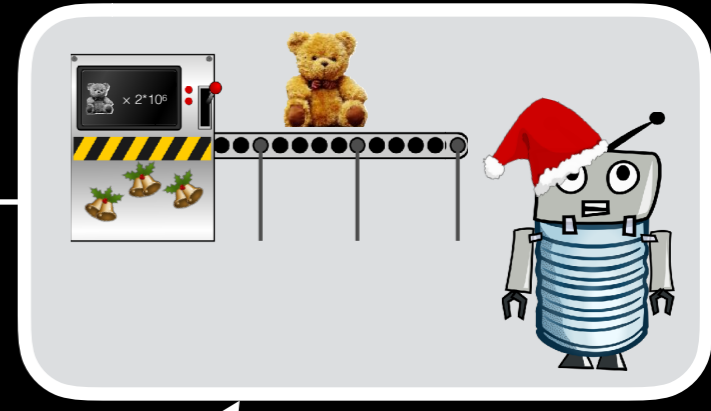
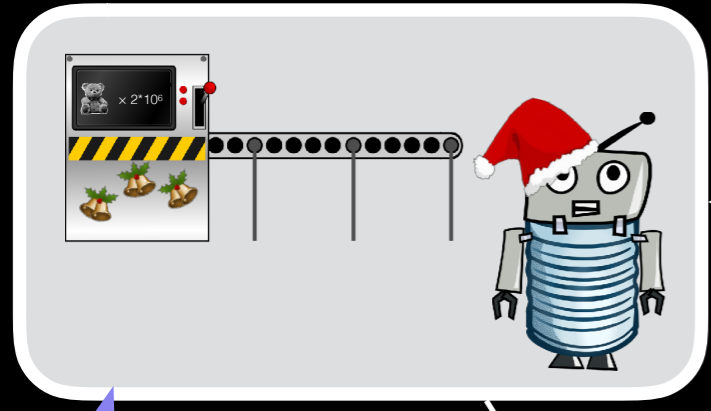
drop!
 $line = 8$

drop!
 $line = 8$



$line \leq 8$

drop!
 $line = 8$



produce!

$line \triangleq 0$
 $bot \triangleq 0$

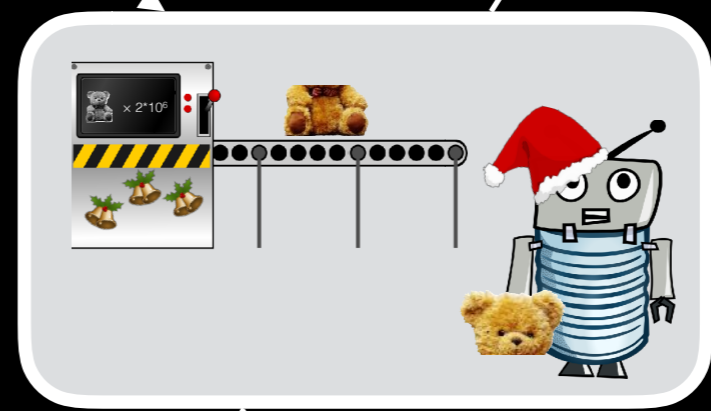
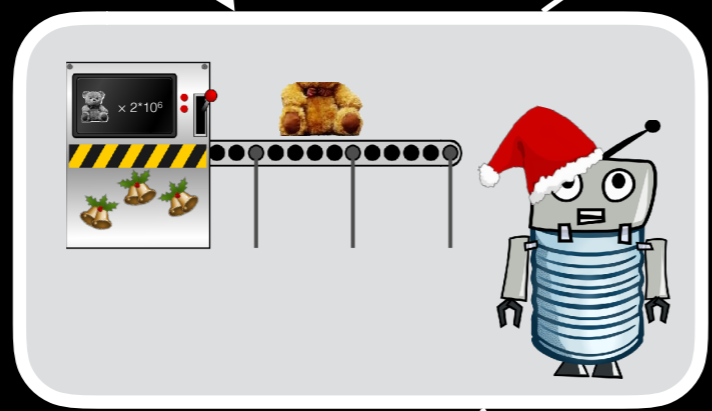
grab!

$bot \geq 2$
 $bot \triangleq 0$

assemble!

$bot \geq 3$

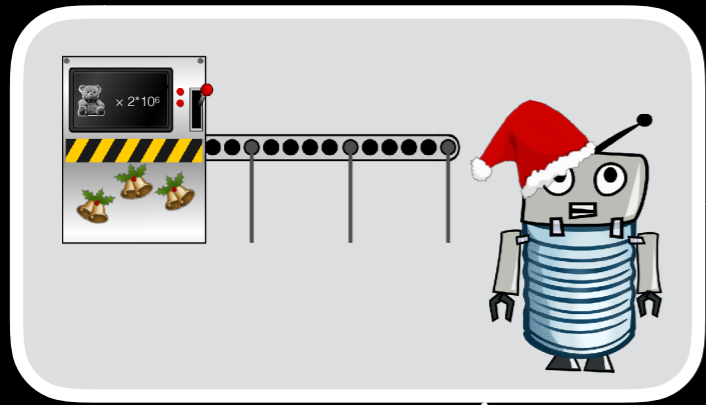
$line = 3$
 $bot = 3$



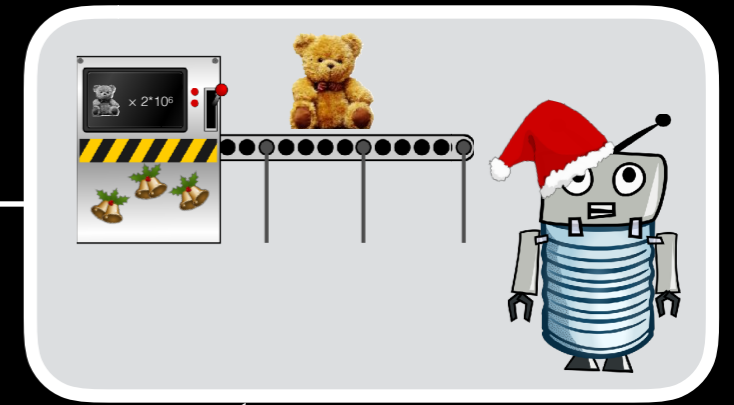
drop!
 $line = 8$

drop!
 $line = 8$





drop!
line = 8



line ≤ 8

produce!
line ≙ 0
bot ≙ 0

grab!
bot ≥ 2
bot ≙ 0

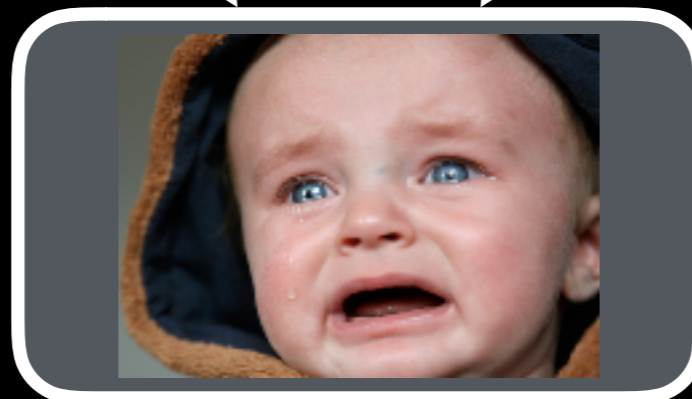
assemble!
bot ≥ 3

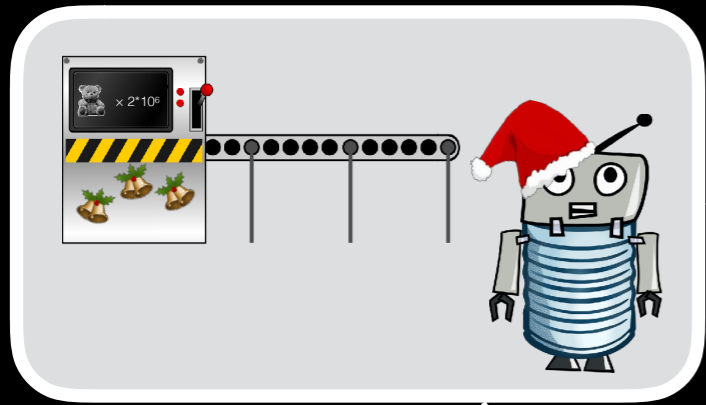


drop!
line = 8

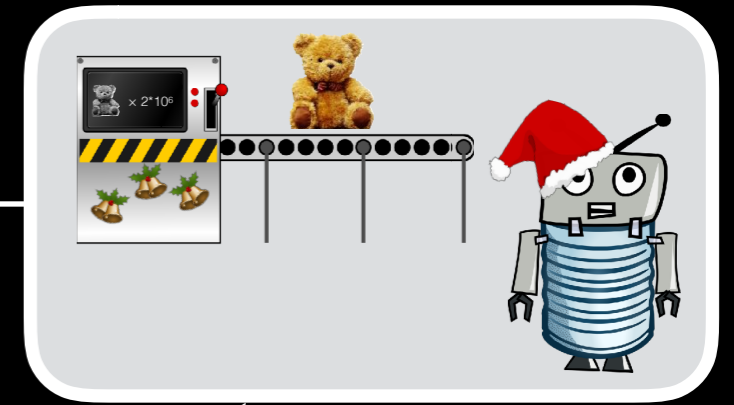
drop!
line = 8

line = 0
bot = 0





drop!
line = 8



line ≤ 8

produce!
line ≙ 0
bot ≙ 0

grab!
bot ≥ 2
bot ≙ 0

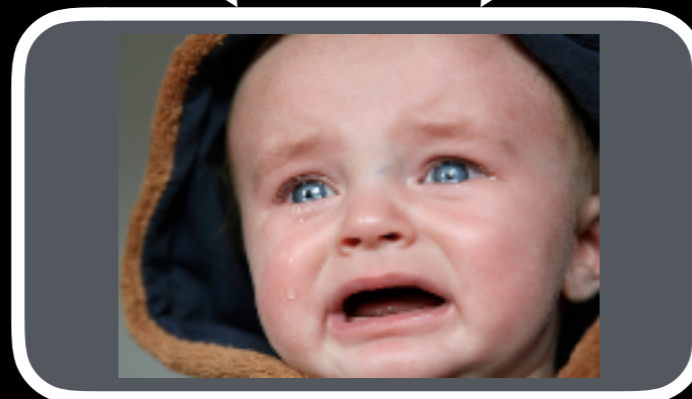
assemble!
bot ≥ 3



drop!
line = 8

drop!
line = 8

line = 2
bot = 2



Games



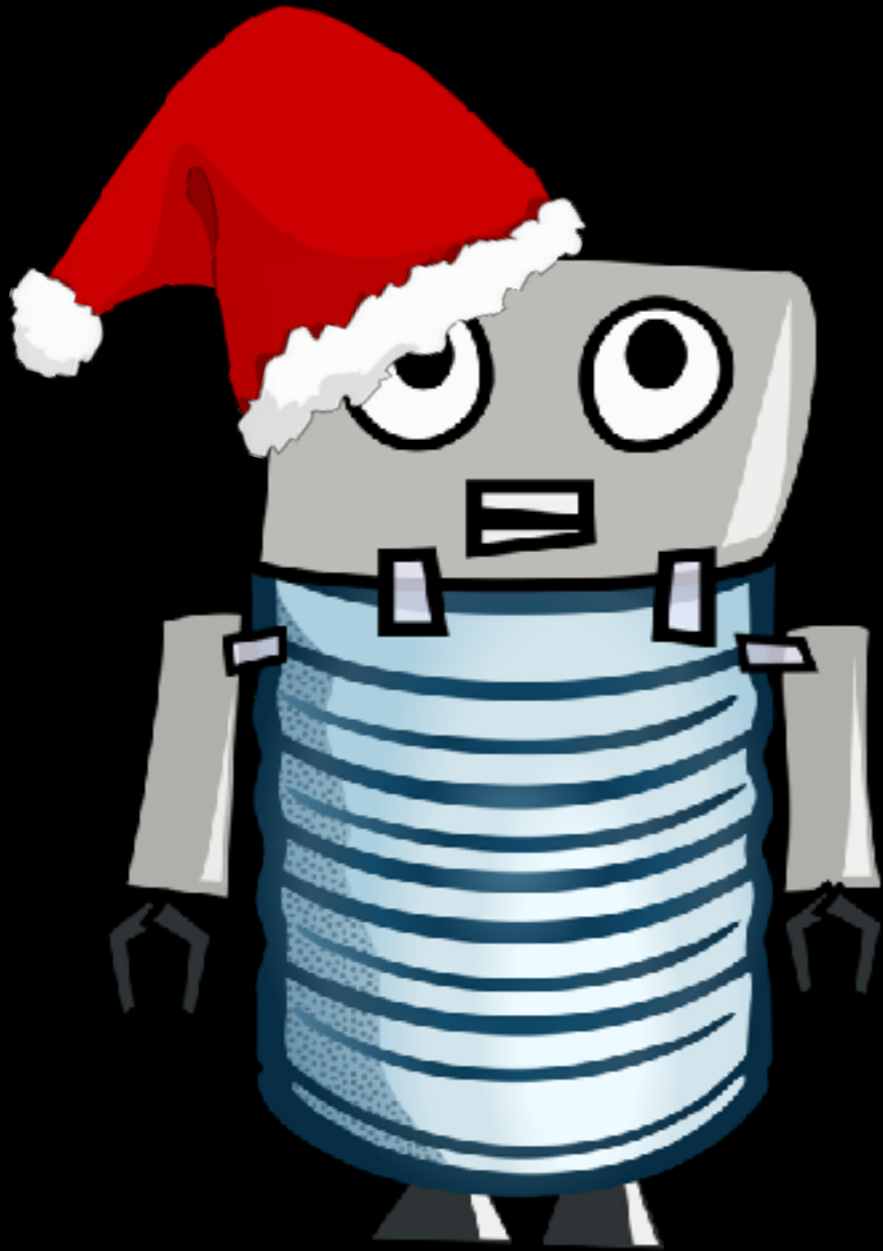
Santa

vs



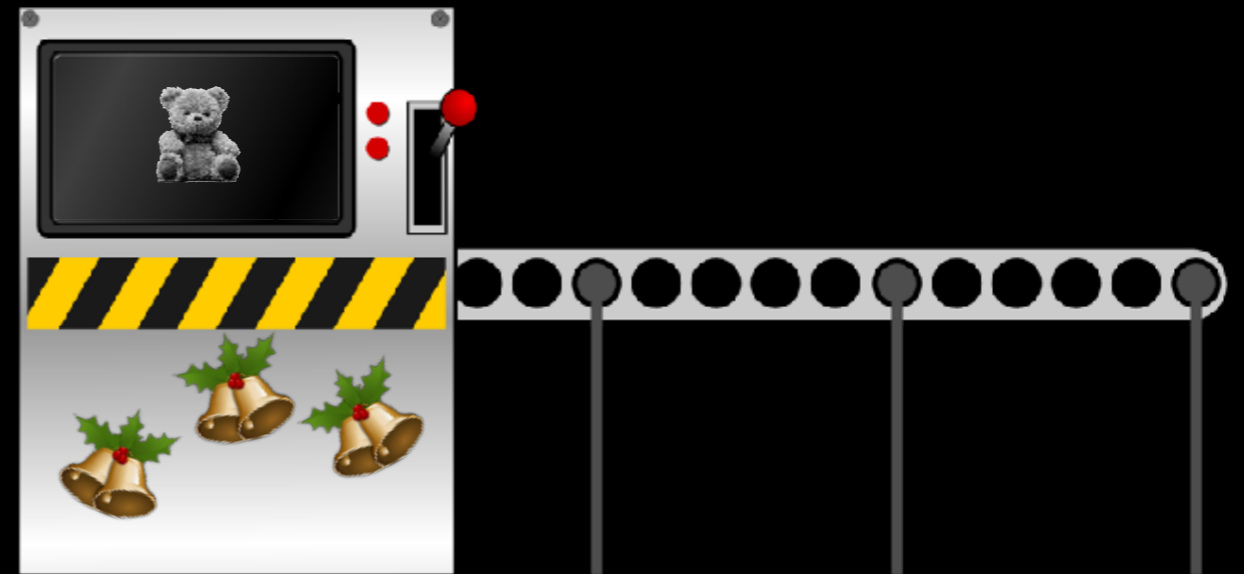
German “Grinch”

Games

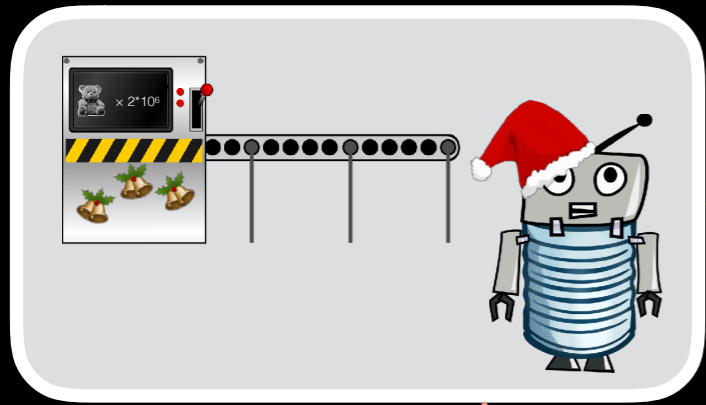


Robot

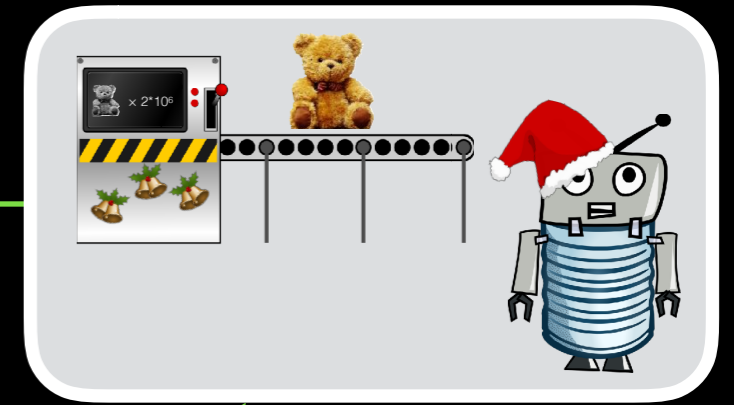
vs



Assembly Line



drop!
line = 8

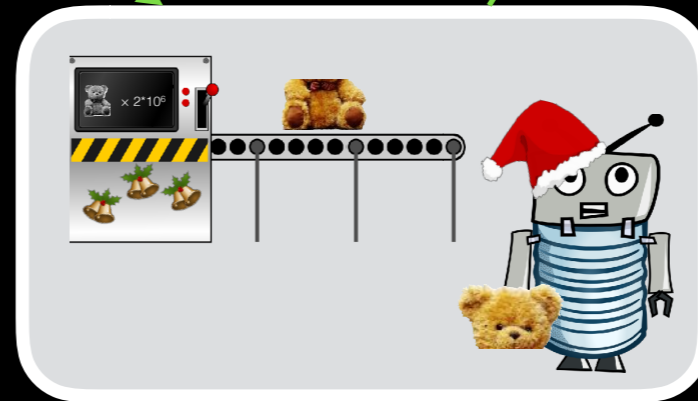


line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

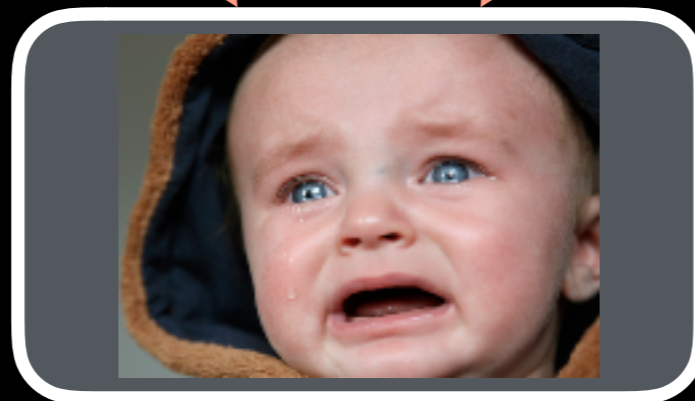
grab!
bot \geq 2
bot \triangleq 0

assemble!
bot \geq 3



drop!
line = 8

drop!
line = 8



Winning Conditions

Winning Conditions

- 1) *Reachability*
Reach a state!

Winning Conditions

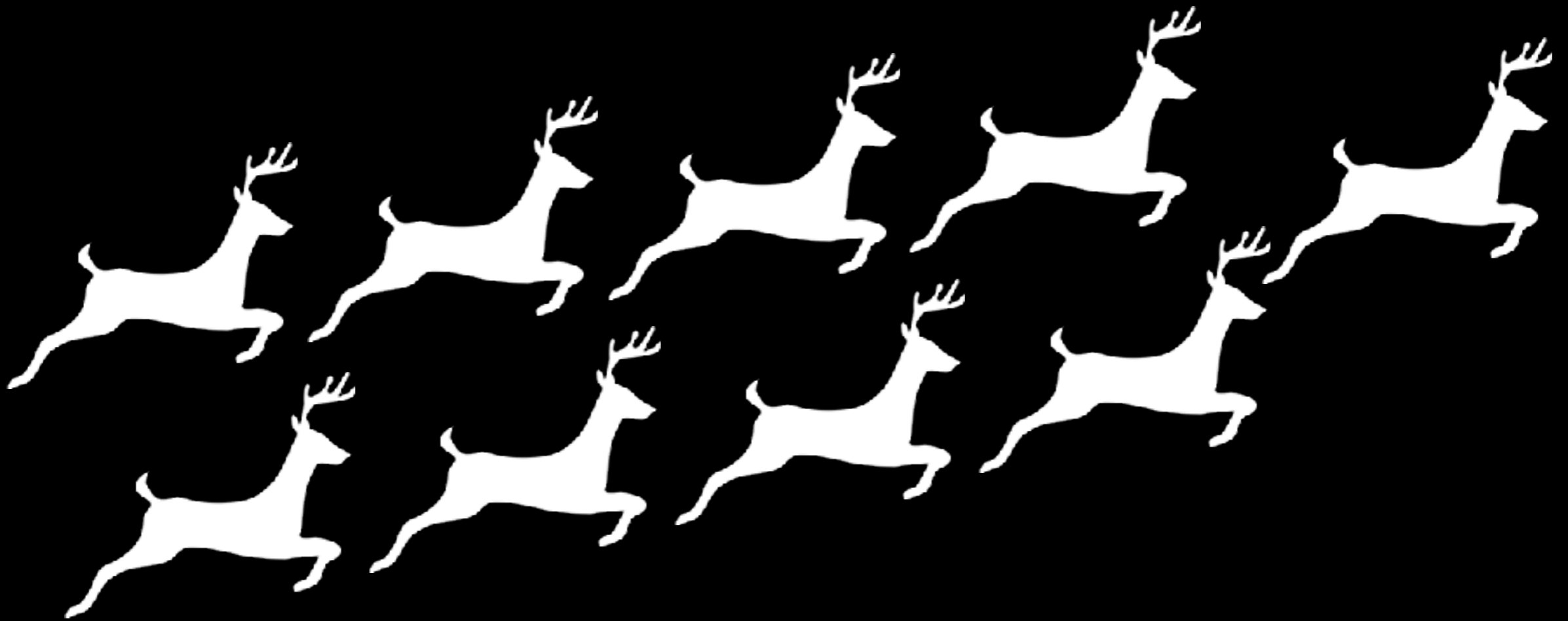
- 1) Reachability
Reach a state!*
- 2) Safety
Avoid a state!*

Winning Conditions

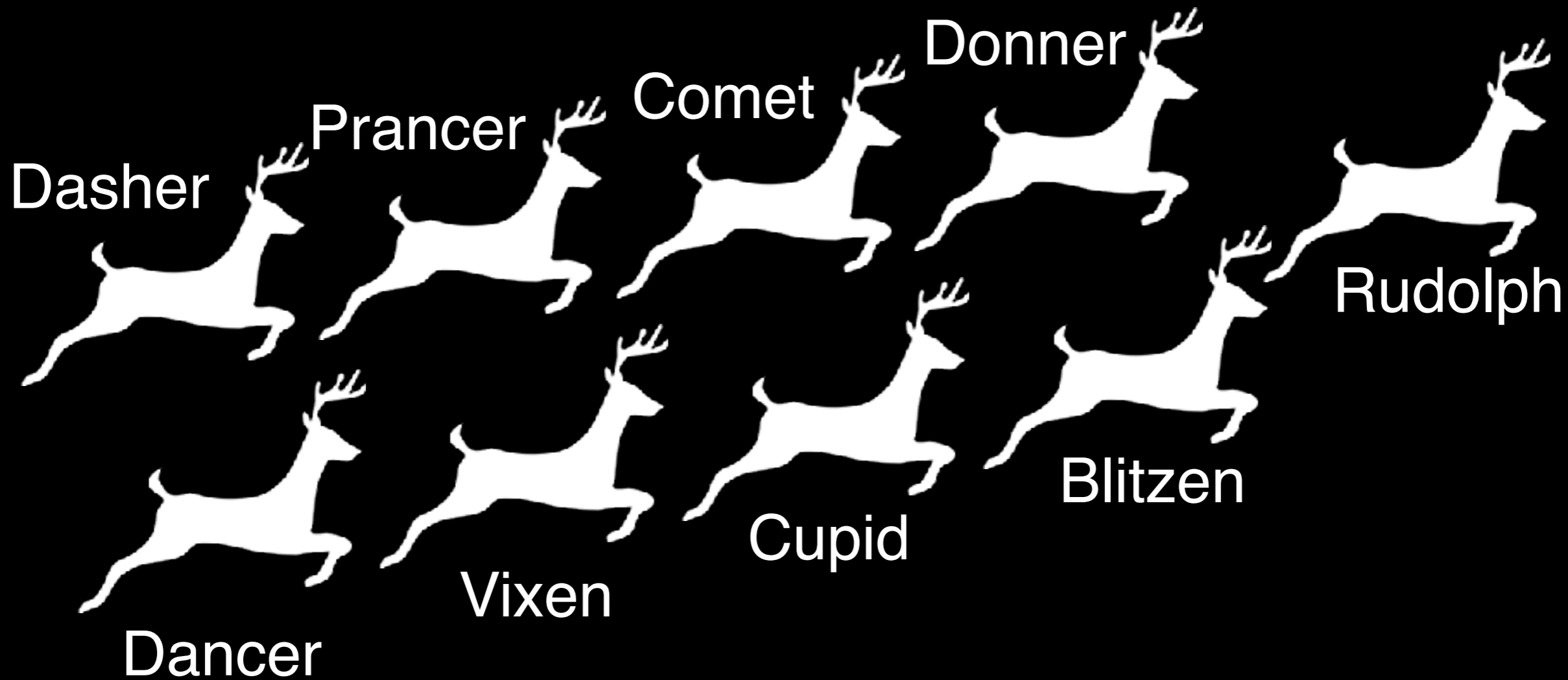
1) *Reachability*
Reach a state!

2) *Safety*
Avoid a state!

3) *Parity*
*Least color that is reached
infinitely often is even!*

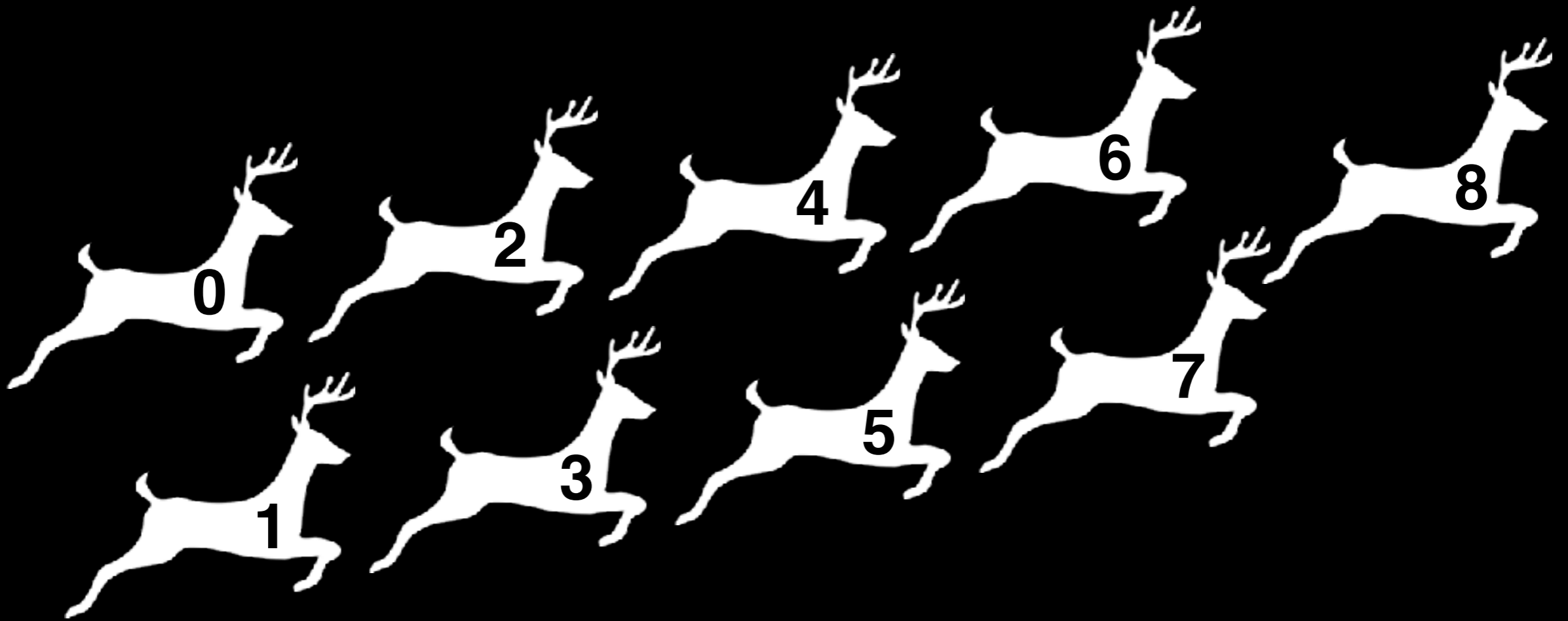


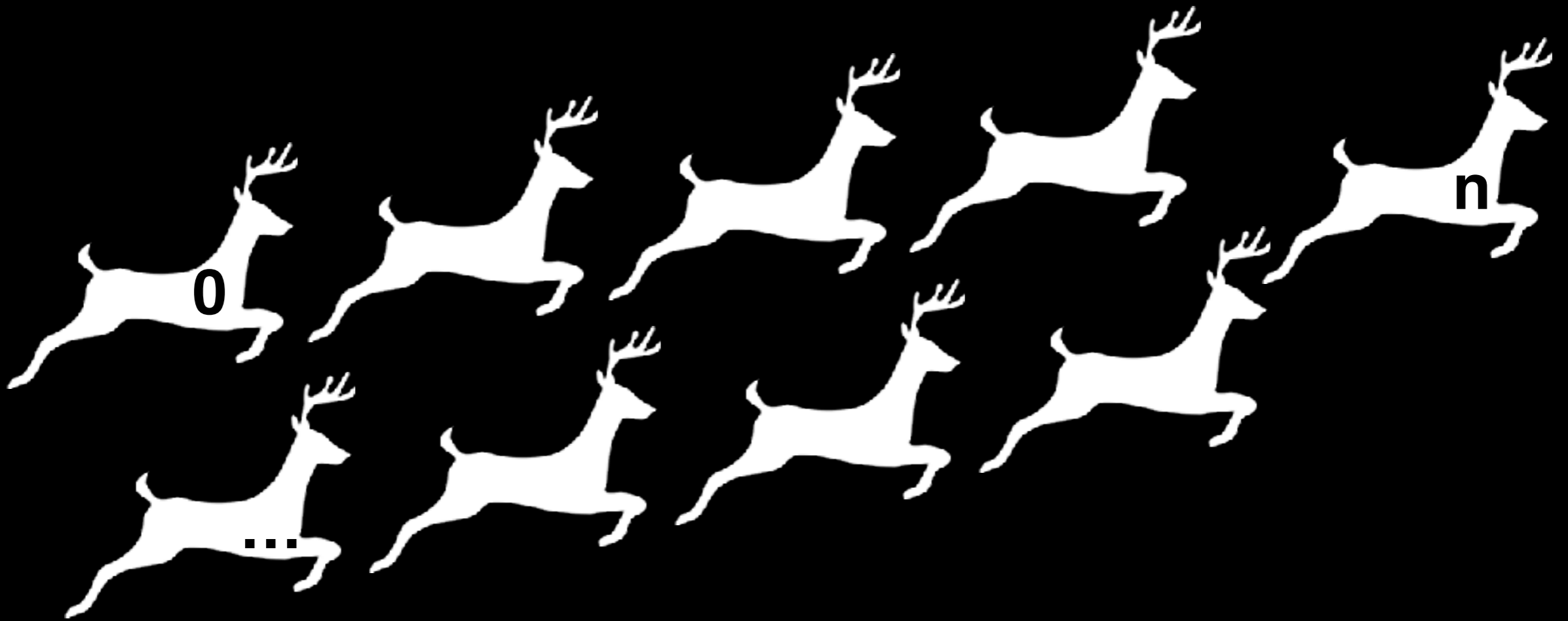
[After *The Night before Christmas* (Author unclear) and *Rudolph, the Red-Nosed Reindeer* (Johnny Marks)]



[After *The Night before Christmas* (Author unclear) and *Rudolph, the Red-Nosed Reindeer* (Johnny Marks)]







Winning Conditions

Winning Conditions

- 1) *Reachability*
Reach a state!

Winning Conditions

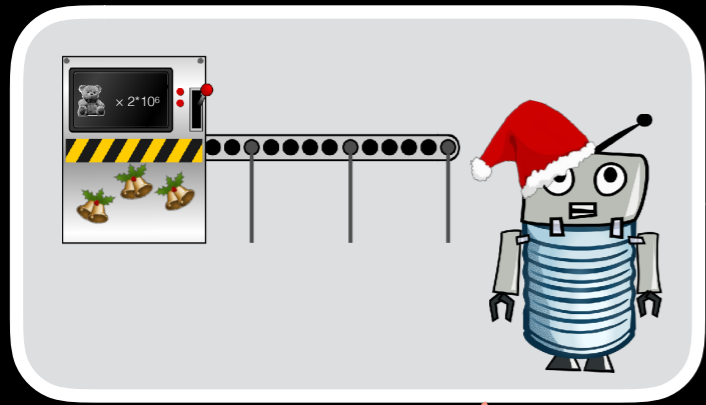
- 1) Reachability
Reach a state!*
- 2) Safety
Avoid a state!*

Winning Conditions

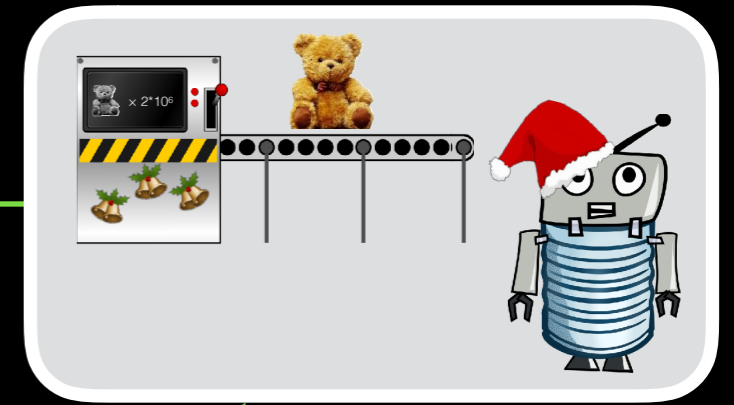
1) Reachability
Reach a state!

2) Safety
Avoid a state!

3) Parity
Least color that is reached
infinitely often is even!



drop!
line = 8

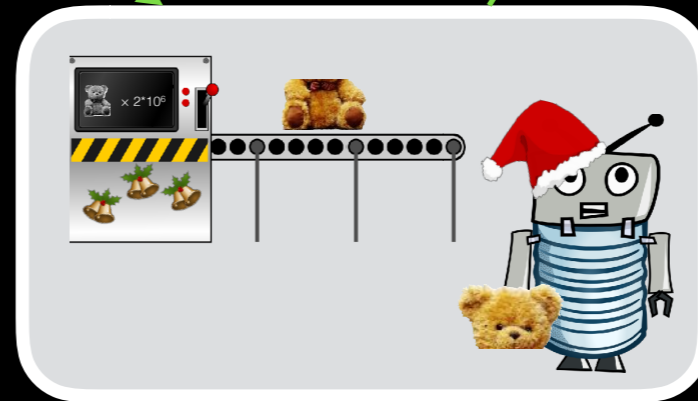
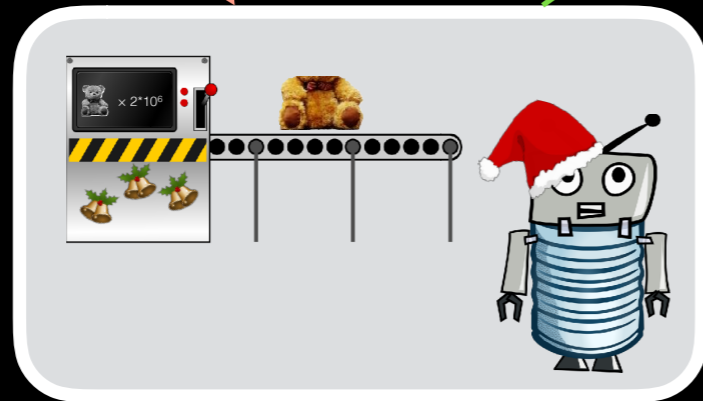


line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

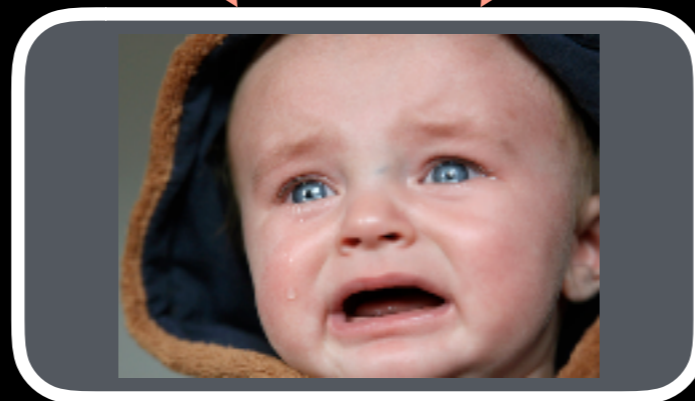
grab!
bot \geq 2
bot \triangleq 0

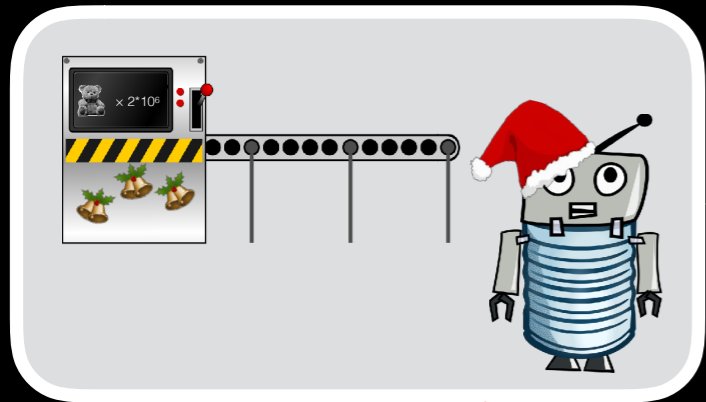
assemble!
bot \geq 3



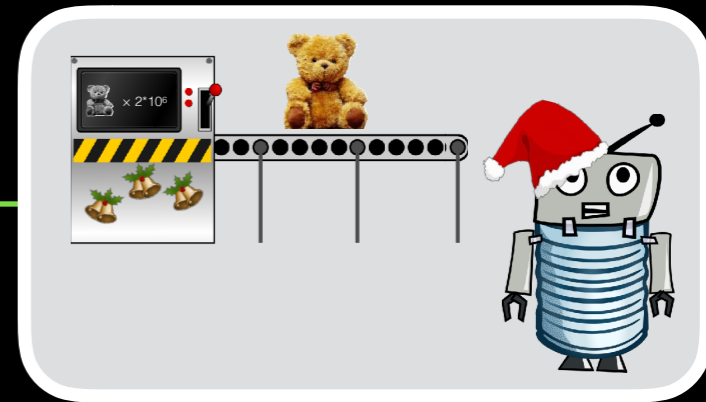
drop!
line = 8

drop!
line = 8





drop!
line = 8



line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

grab!
bot \geq 2
bot \triangleq 0

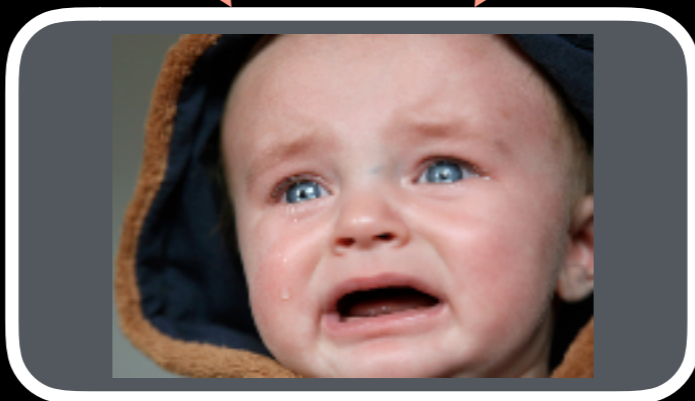
assemble!
bot \geq 3

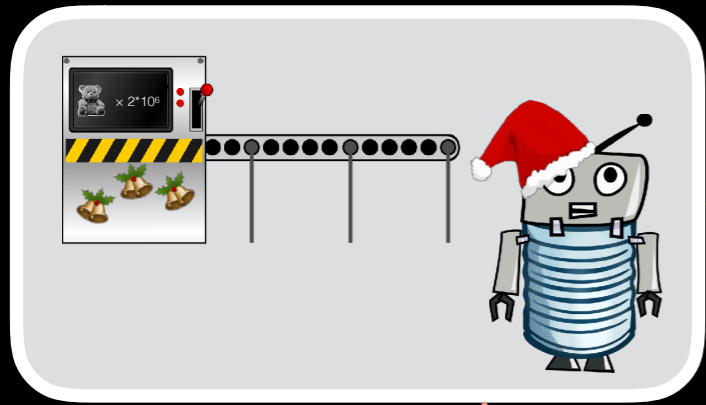


drop!
line = 8

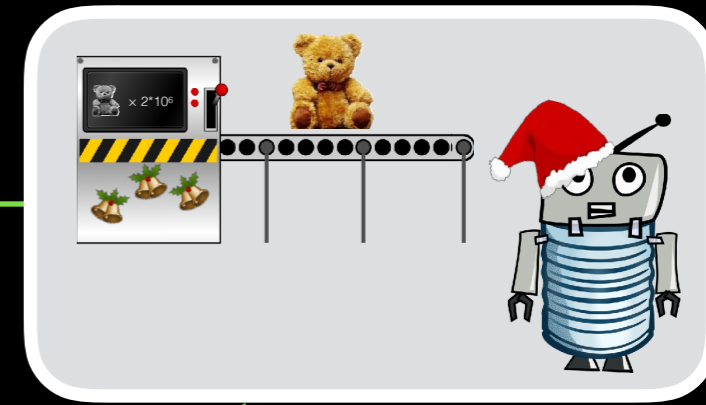
drop!
line = 8

Reachability
versus
Safety





drop!
line = 8



line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

grab!
bot \geq 2
bot \triangleq 0

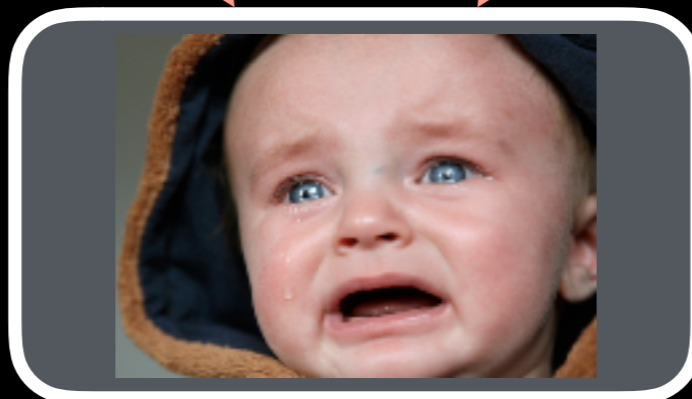
assemble!
bot \geq 3

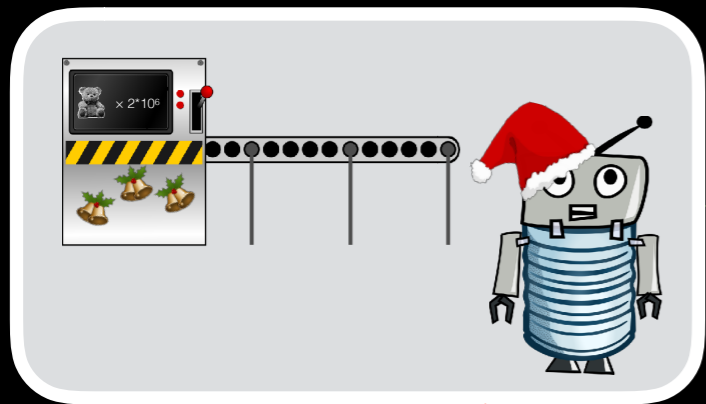


drop!
line = 8

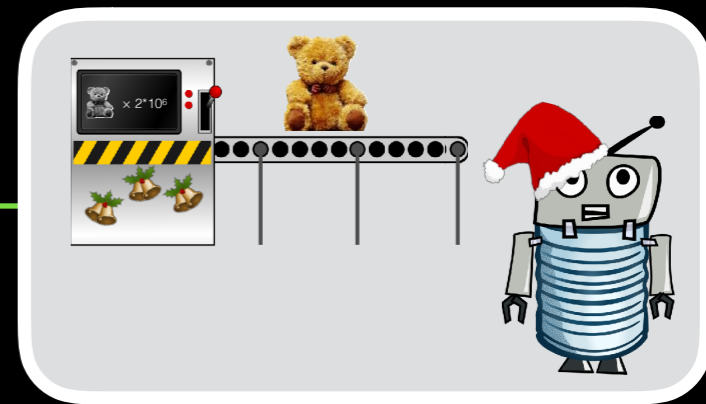
drop!
line = 8

win
=
do not lose





drop!
line = 8



line ≤ 8

produce!
line ≙ 0
bot ≙ 0

grab!
bot ≥ 2
bot ≙ 0

assemble!
bot ≥ 3

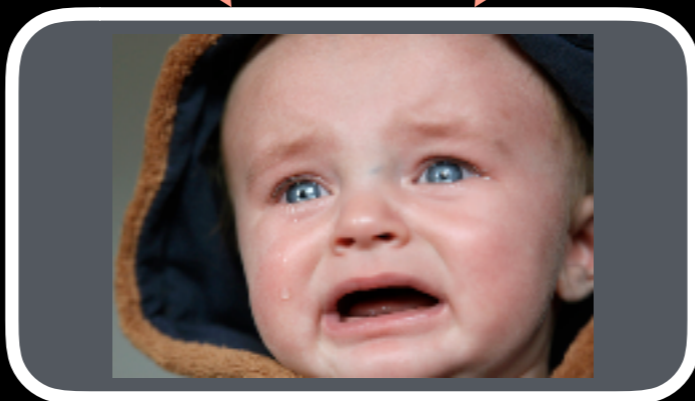


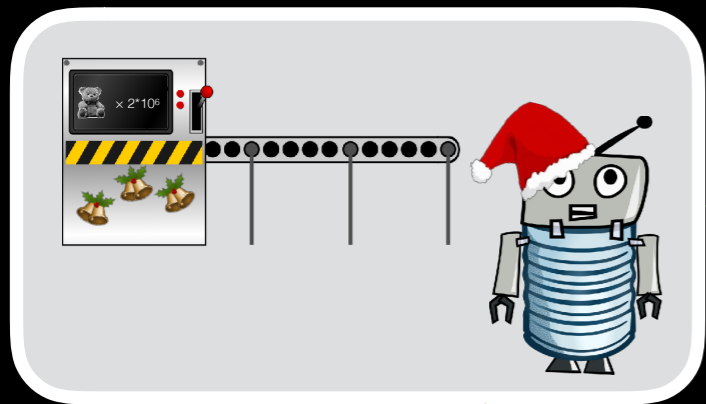
drop!
line = 8

drop!
line = 8

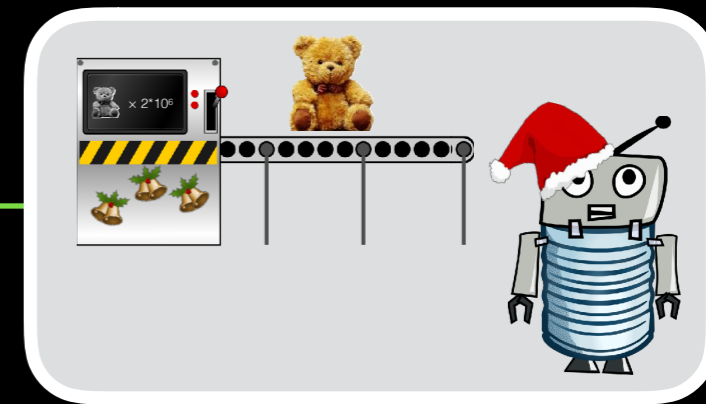
Strategy:

win
=
do not lose





drop!
line = 8

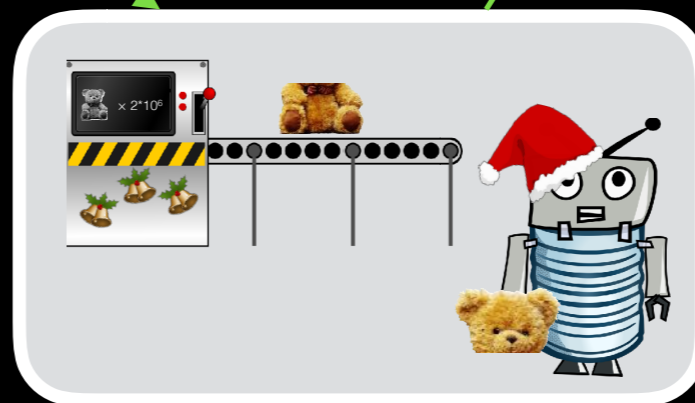
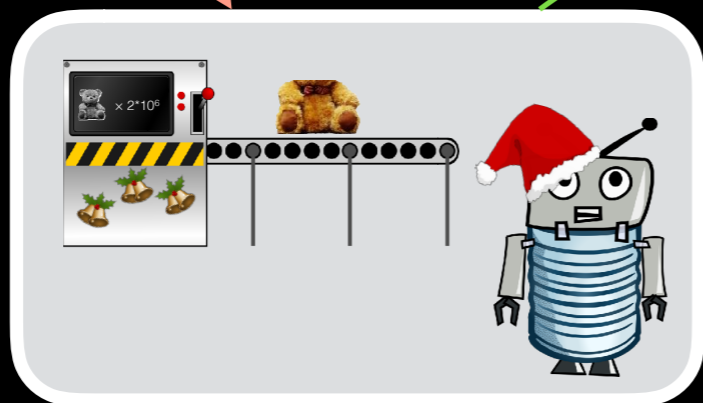


line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

grab!
bot \geq 2
bot \triangleq 0

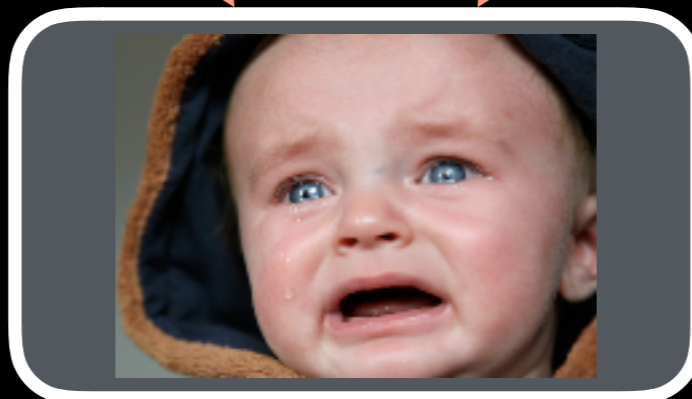
assemble!
bot \geq 3



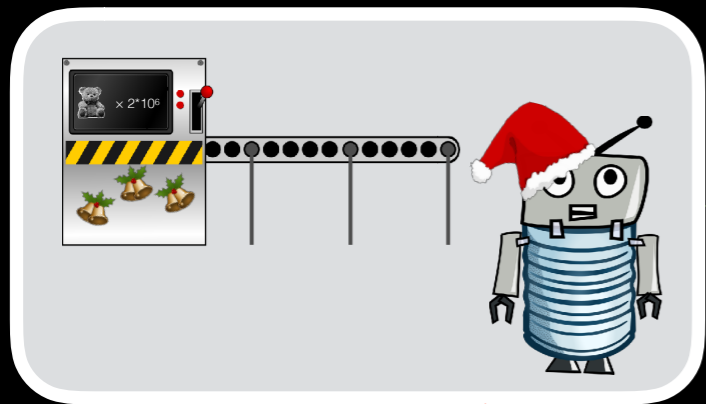
drop!
line = 8

drop!
line = 8

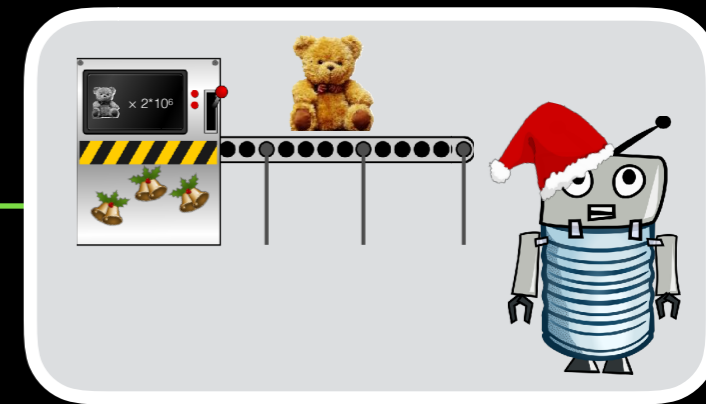
win
=
do not lose



Strategy:
1) **assemble!**
before
line = 8



drop!
line = 8

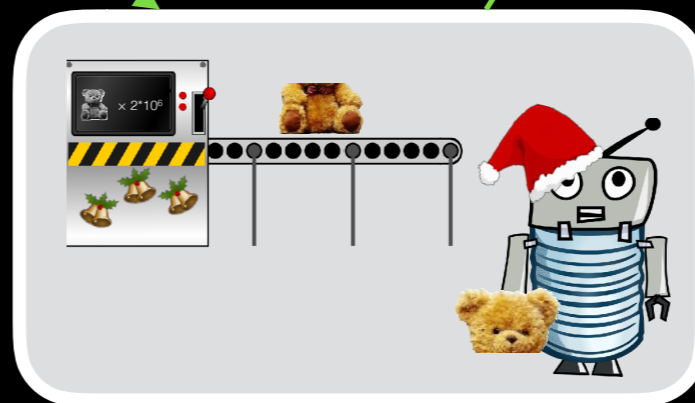


line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

grab!
bot \geq 2
bot \triangleq 0

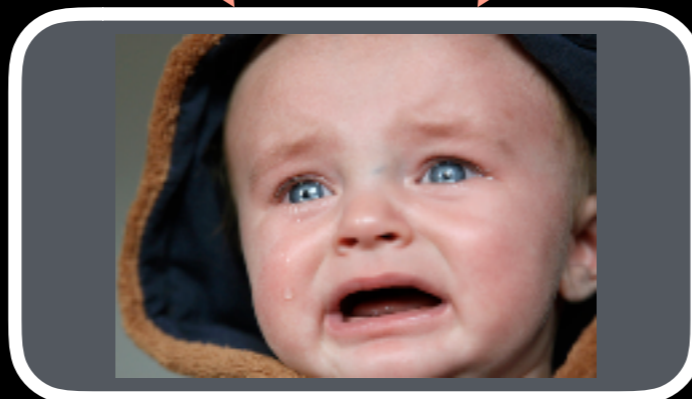
assemble!
bot \geq 3



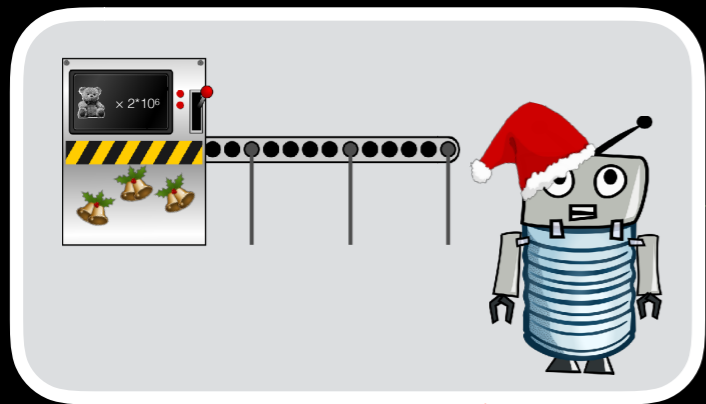
drop!
line = 8

drop!
line = 8

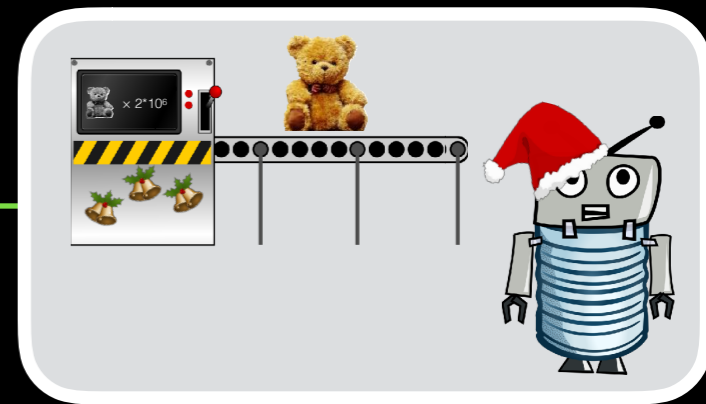
win
=
do not lose



- Strategy:**
- 1) **assemble!**
before
line = 8
 - 2) **grab!**
before
line = 5



drop!
line = 8



line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

grab!
bot \geq 2
bot \triangleq 0

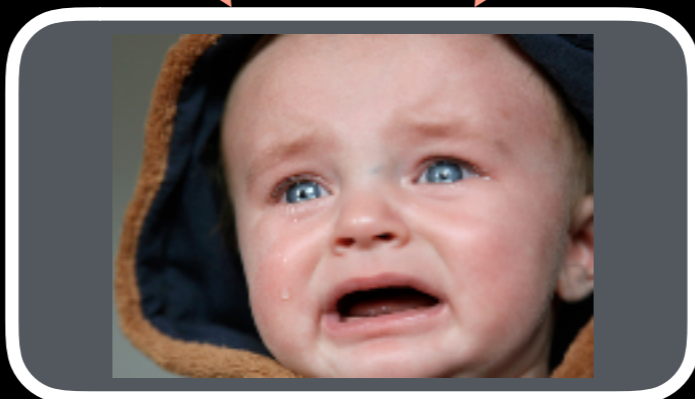
assemble!
bot \geq 3



drop!
line = 8

drop!
line = 8

win
=
do not lose

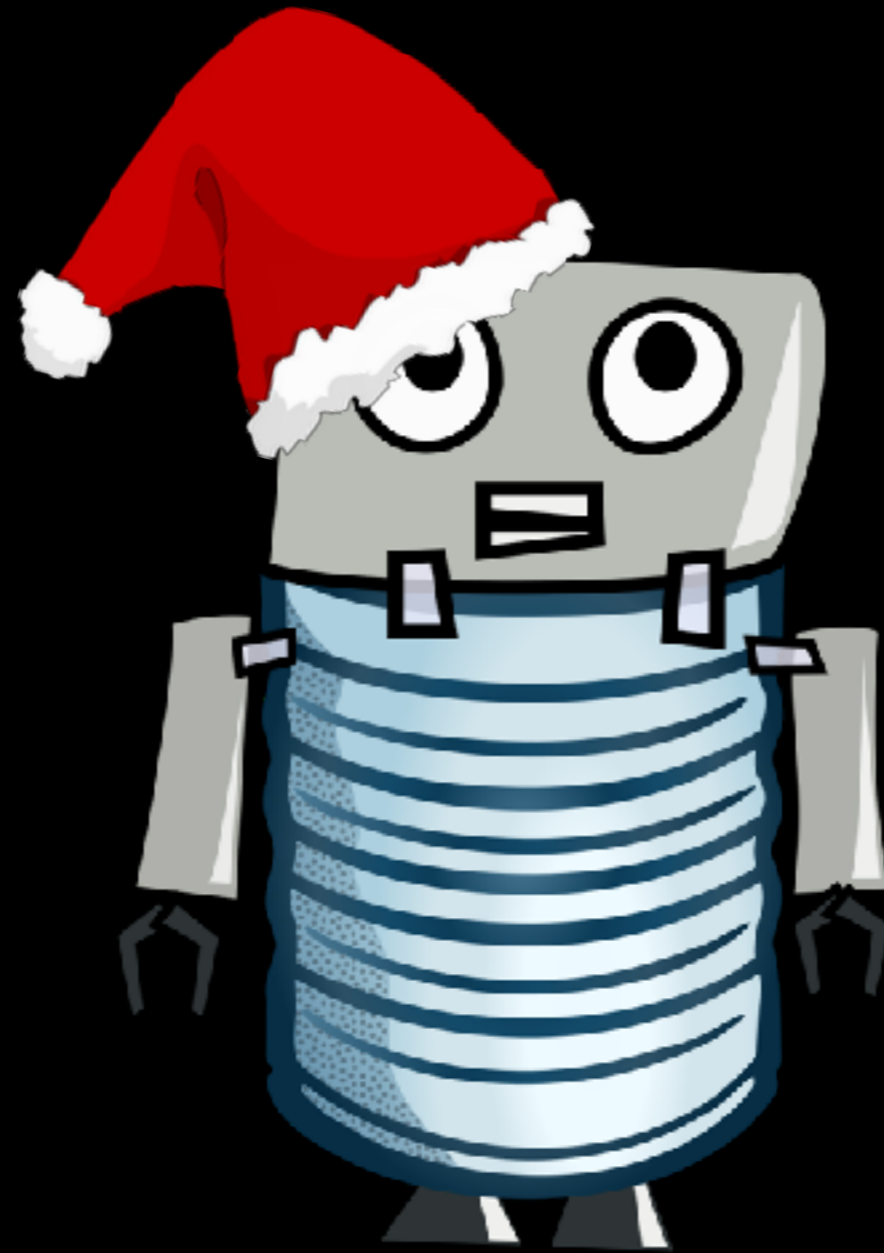


- Strategy:**
- 1) **assemble!**
before
line = 8
 - 2) **grab!**
before
line = 5
 - 3) **drop!**
when
line = 8

Easy Peasy!



Easy Peasy!











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5

10

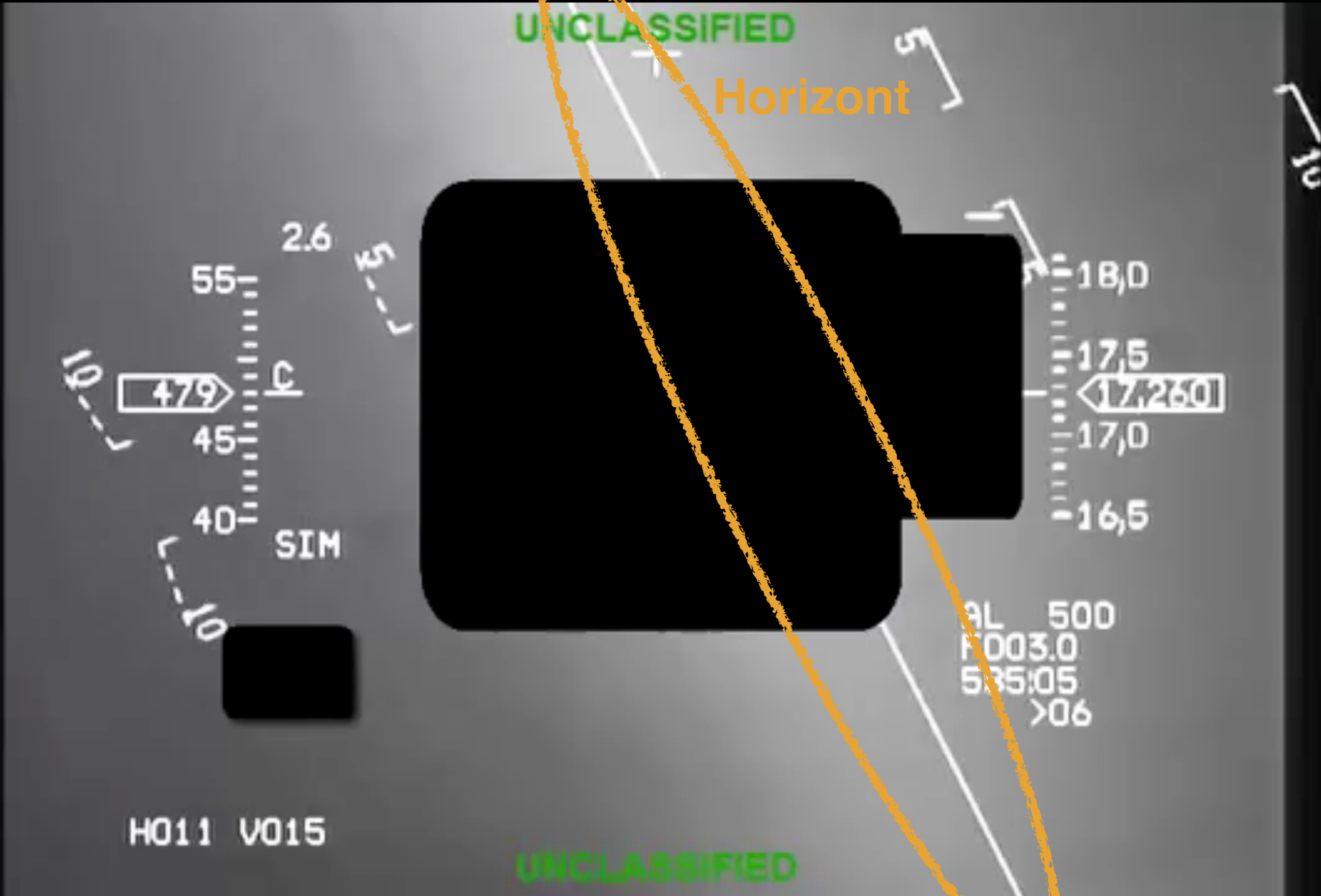


AL 500
FO03.0
585:05
>06

H011 V015

UNCLASSIFIED

Thanks to Aviation Week "Auto-GCAS Saves Unconscious F-16 Pilot—Declassified USAF Footage"
<http://aviationweek.com/air-combat-safety/auto-gcas-saves-unconscious-f-16-pilot-declassified-usaf-footage>



UNCLASSIFIED

Horizont

UNCLASSIFIED

H011 V015

SIM

479

55

45

40

2.6

18,0

17,5

17,260

17,0

16,5

AL 500

R003.0

535:05

>06

10

10

10

Thanks to Aviation Week "Auto-GCAS Saves Unconscious F-16 Pilot—Declassified USAF Footage" <http://aviationweek.com/air-combat-safety/auto-gcas-saves-unconscious-f-16-pilot-declassified-usaf-footage>

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5

10

2.6

55

479

45

40

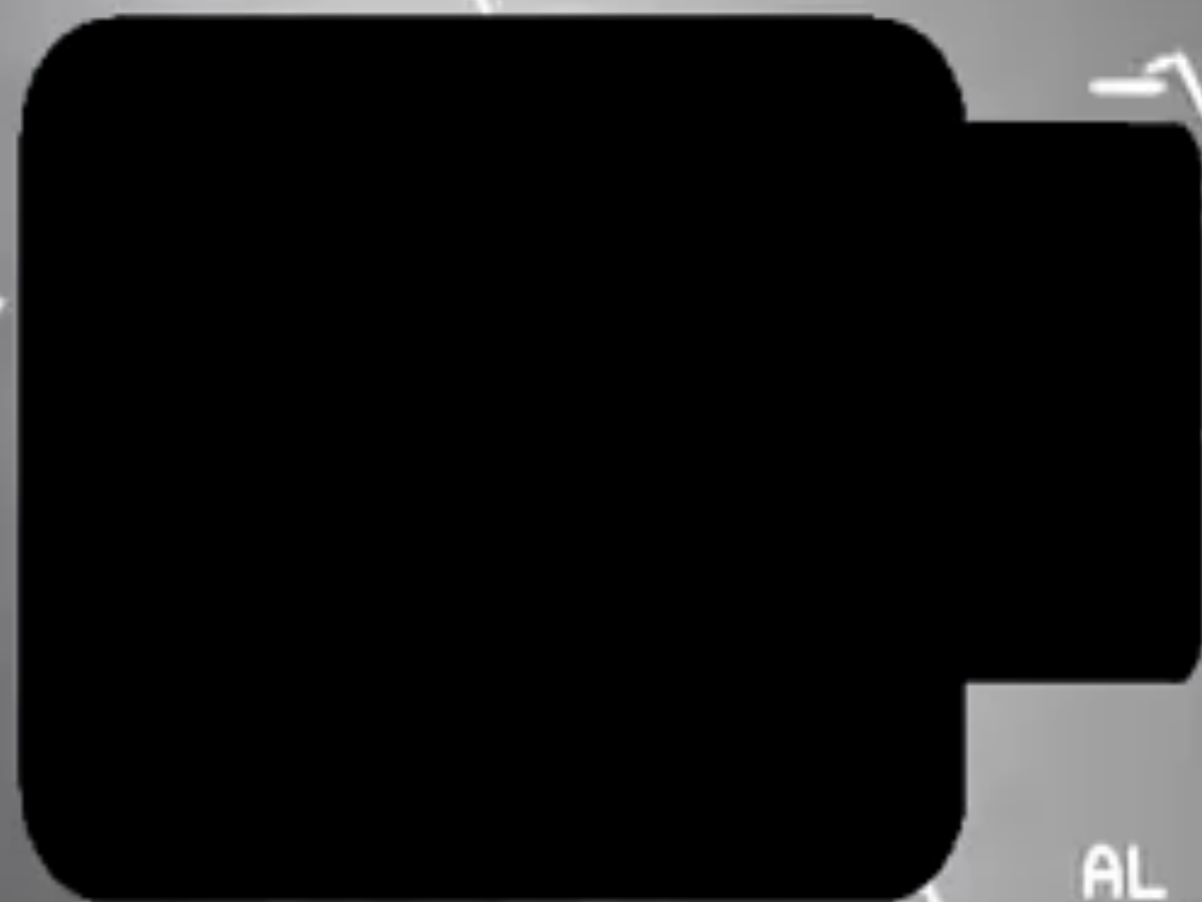
SIM

10



H011 V015

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18,0

Höhe [ft]

17,5

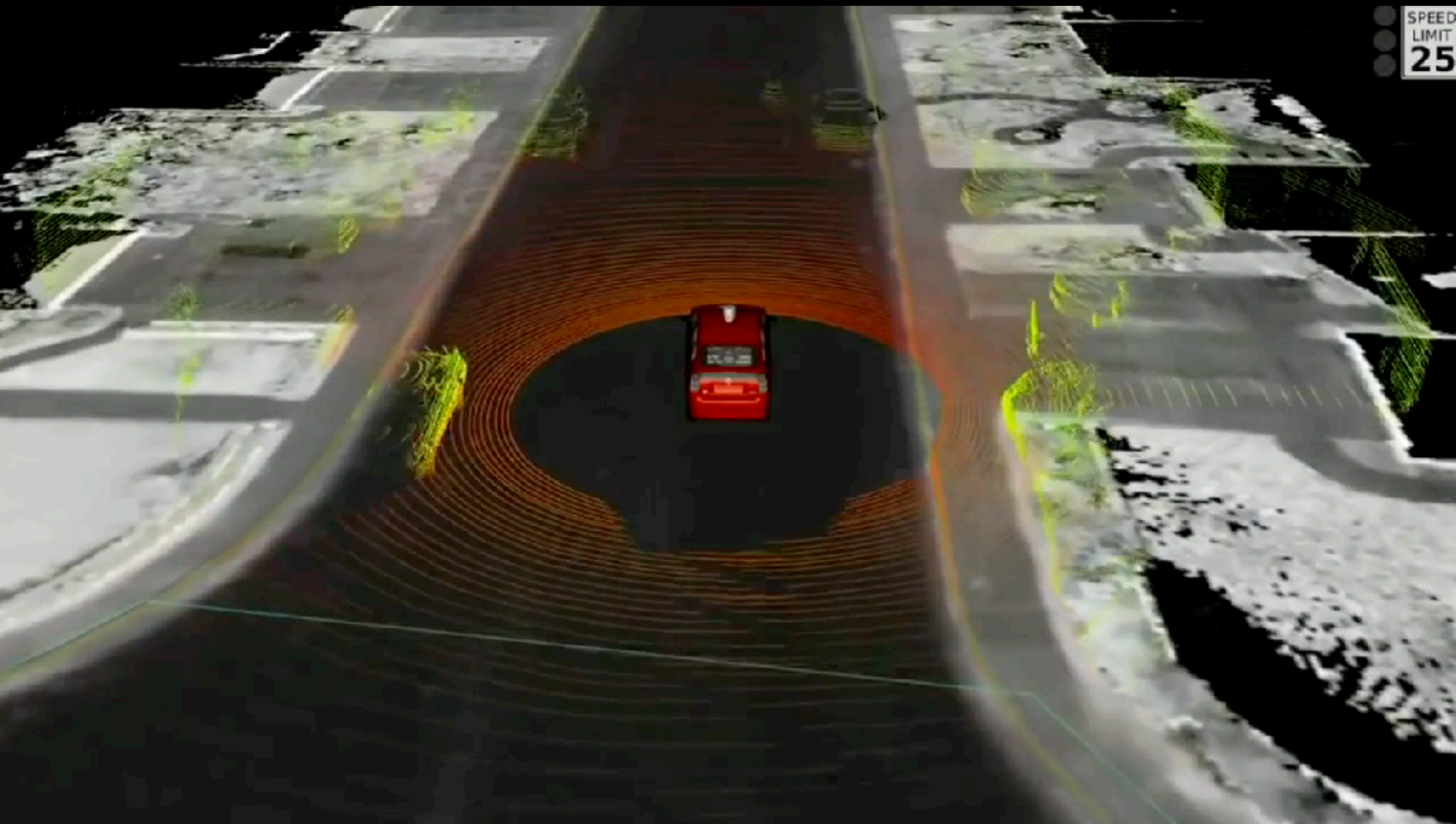
17,260

17,0

16,5

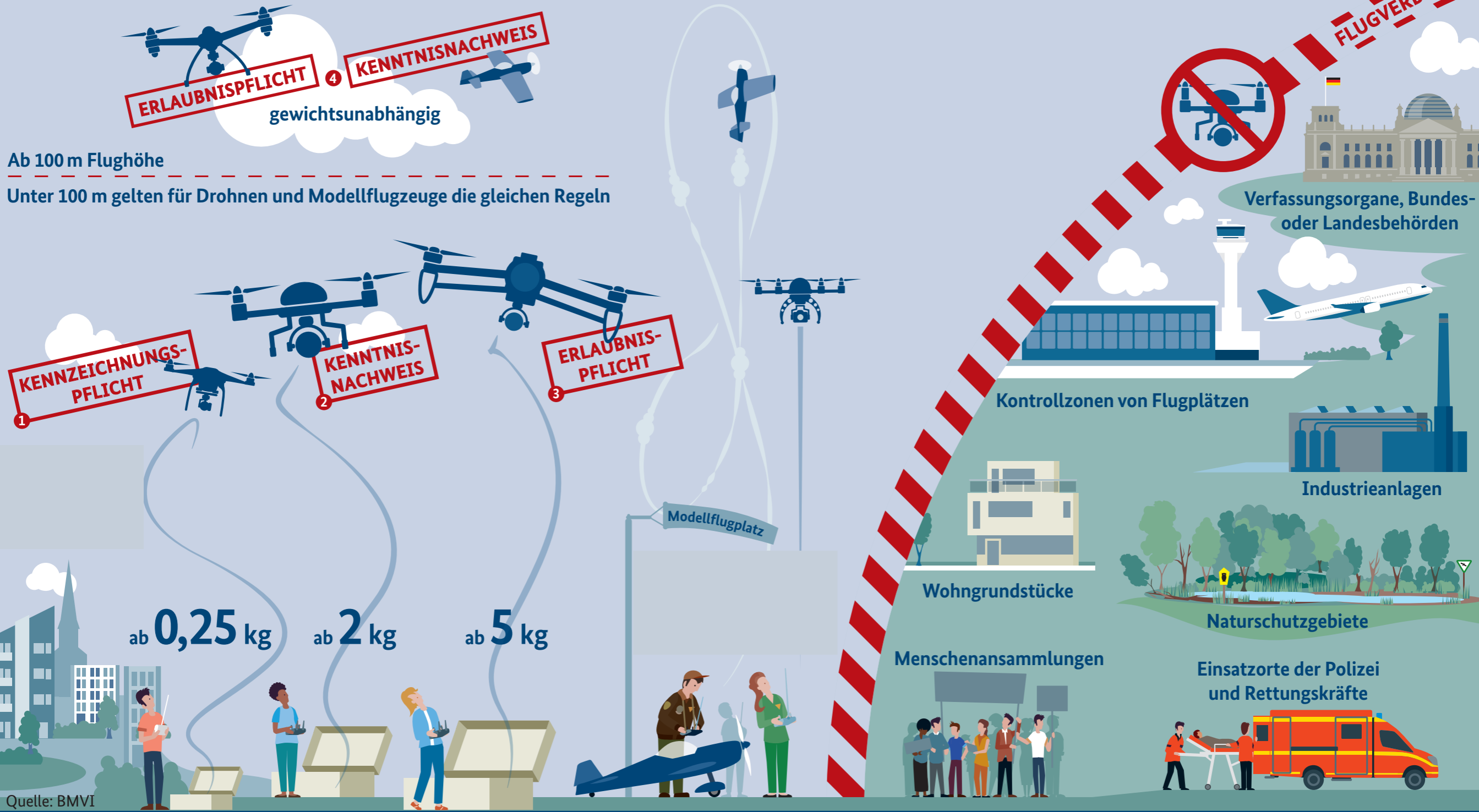
AL 500
FO03.0
585:05
>06

Thanks to Aviation Week "Auto-GCAS Saves Unconscious F-16 Pilot—Declassified USAF Footage"
<http://aviationweek.com/air-combat-safety/auto-gcas-saves-unconscious-f-16-pilot-declassified-usaf-footage>



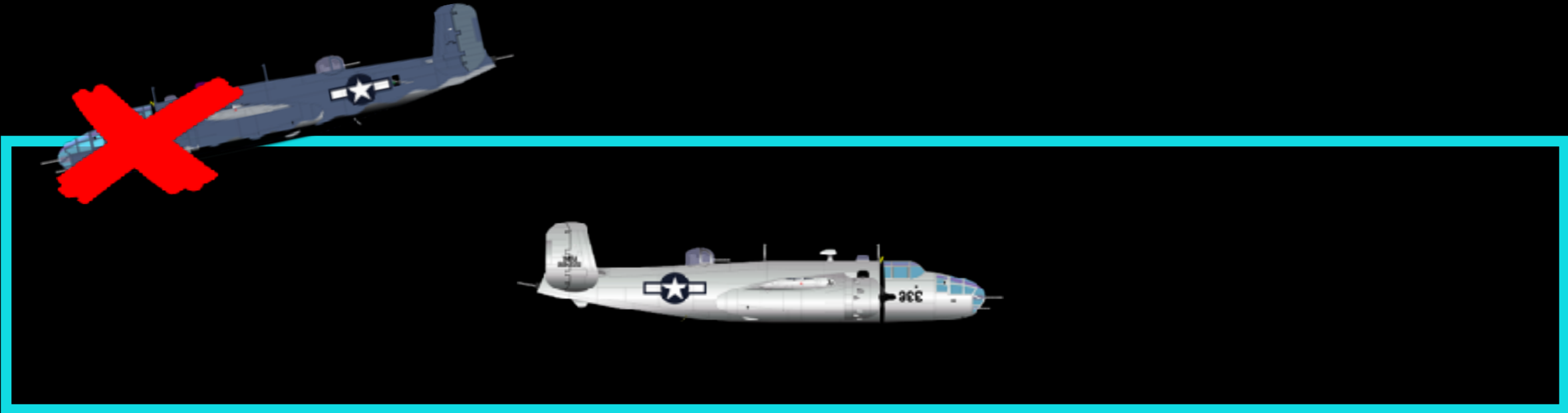
<https://www.youtube.com/watch?v=AQkMu8eBDQg>

Die neue Drohnen-Verordnung



**Fully
Autonomous
Sleigh?**







ca 300m / 1000ft

ca 9km / 5 nmi







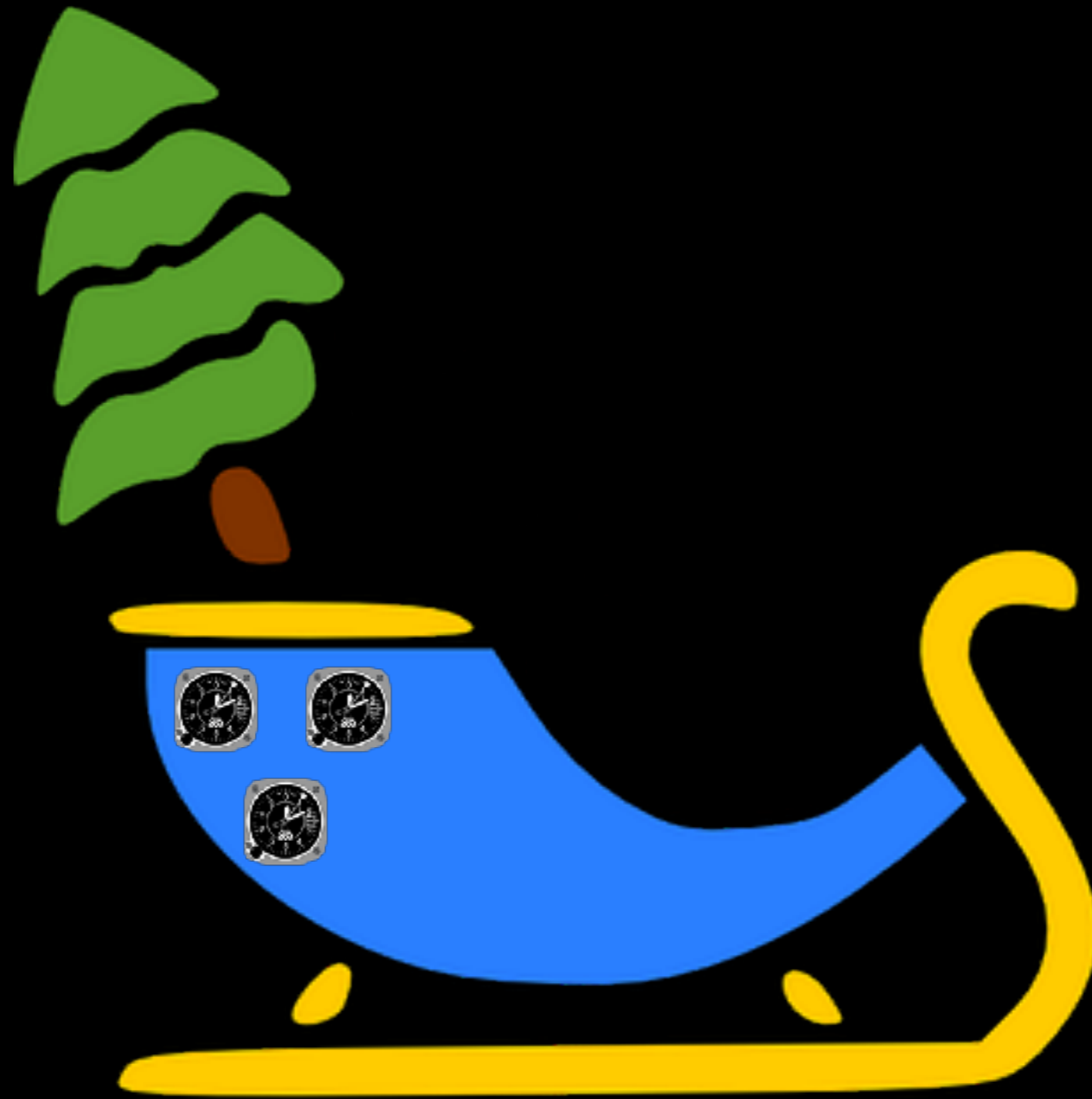


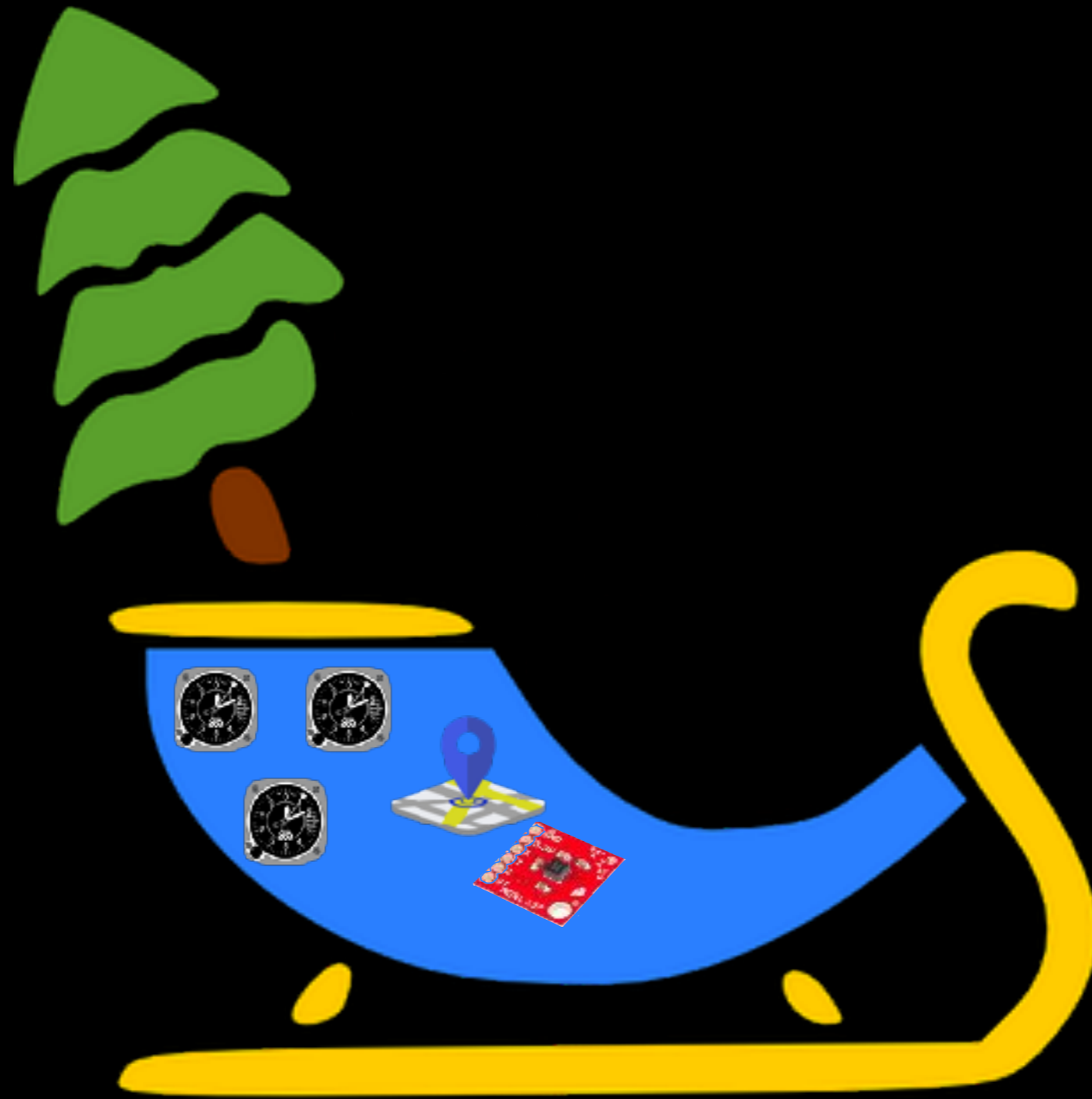


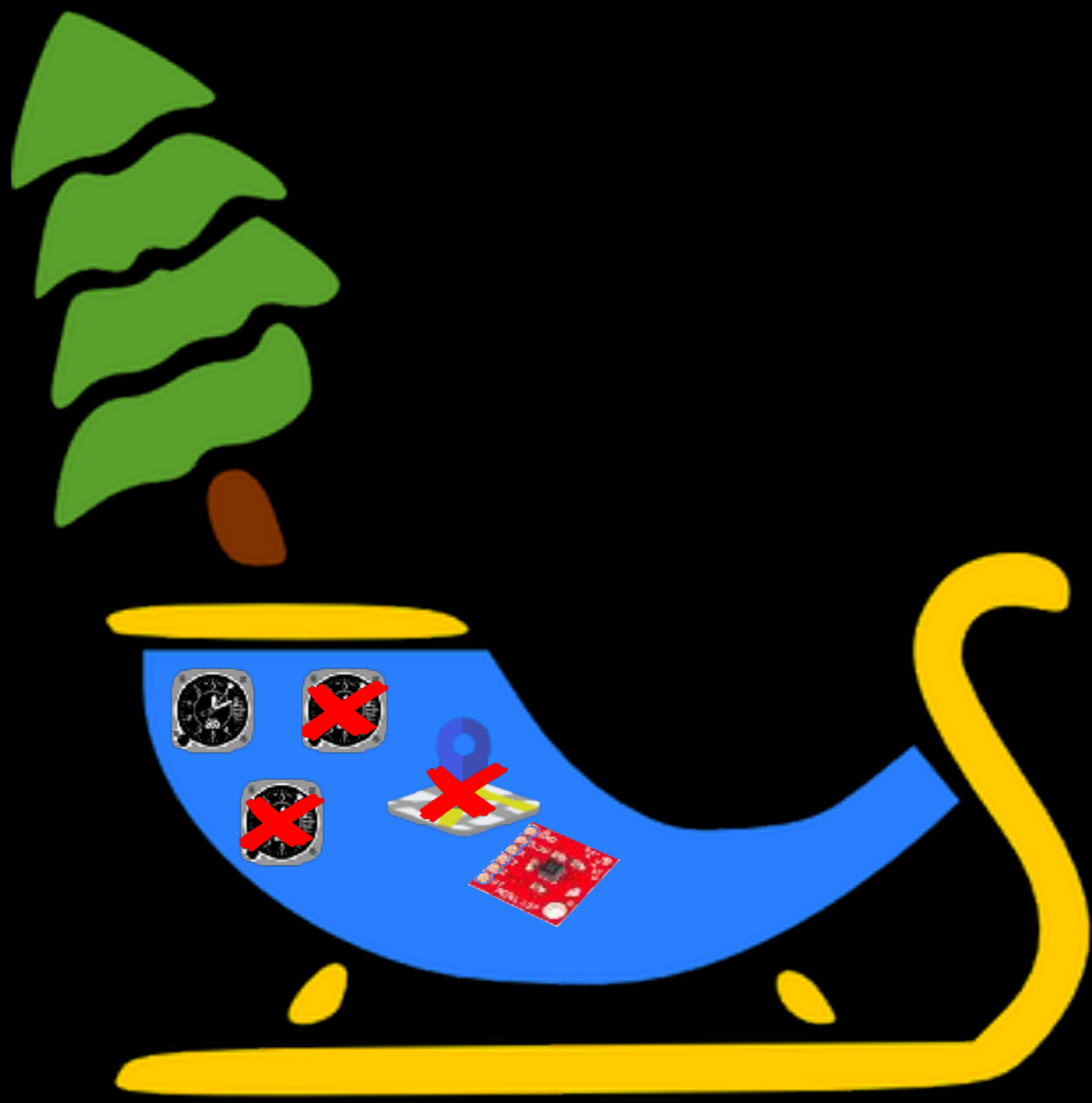










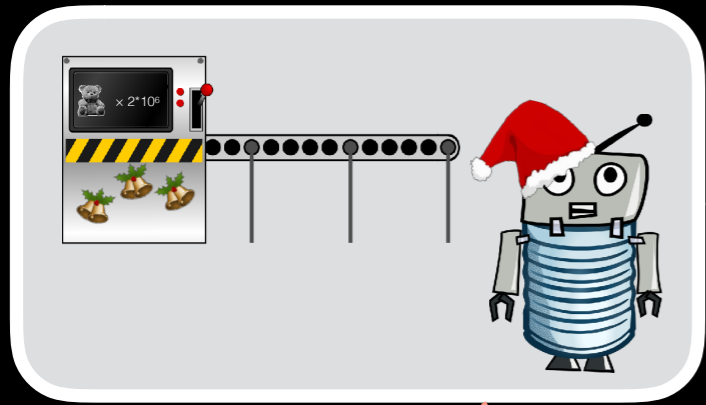




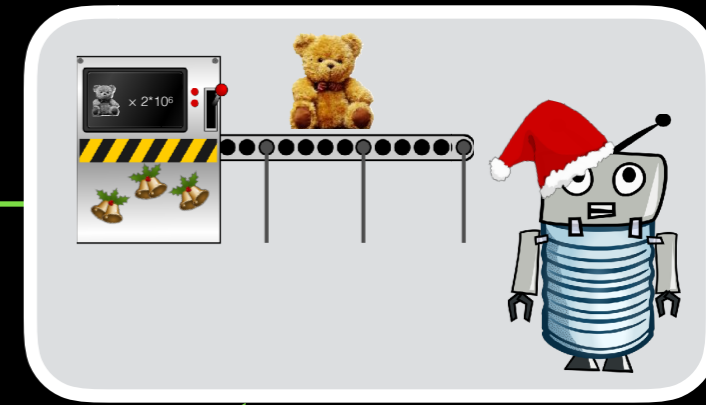








drop!
line = 8

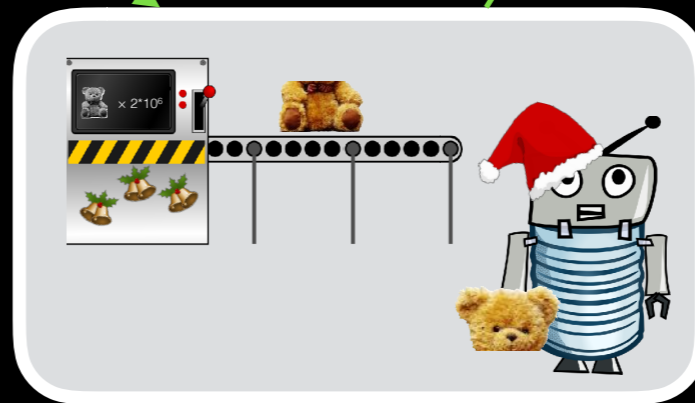


line \leq 8

produce!
line \triangleq 0
bot \triangleq 0

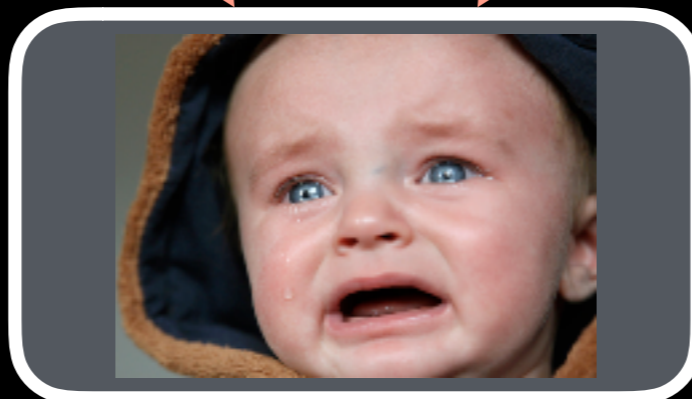
grab!
bot \geq 2
bot \triangleq 0

assemble!
bot \geq 3



drop!
line = 8

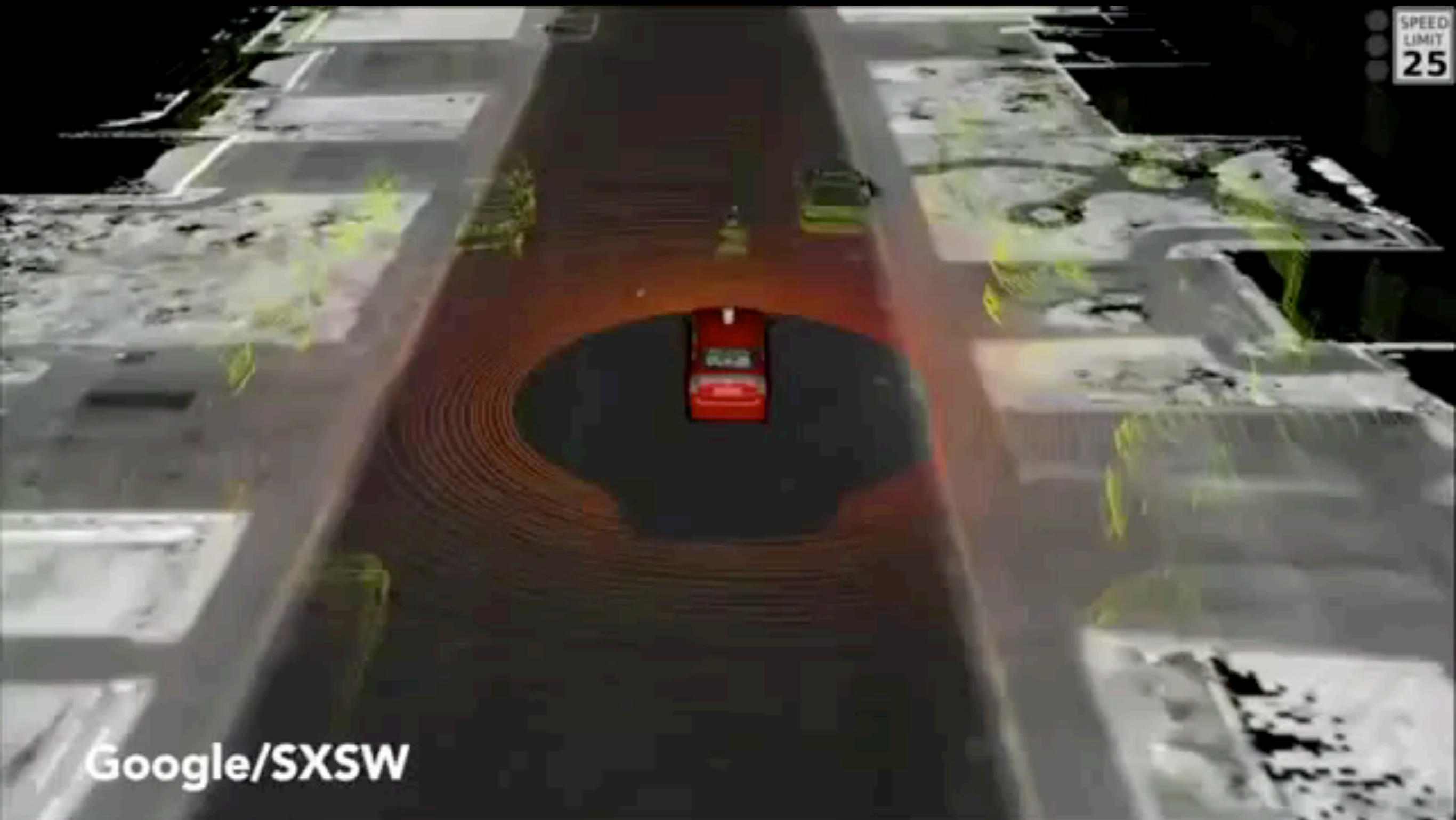
drop!
line = 8





Special thanks to Hanna Kullack for helping to prepare the slides!

Wait — There's more!



<https://www.youtube.com/watch?v=AQkMu8eBDQg>