Toolkit: Name That Tune
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1. Movie 1980: $p \wedge q$, where $p =$ "It's dark outside" and $q =$ "We're wearing sunglasses."

2. Pop music 1986: $\neg(q \Rightarrow p) \wedge \neg(s \Rightarrow r)$, where $p =$ "You are rich," $q =$ "You are my girl,"

   $r =$ "You are cool," and $s =$ "You rule my world."

3. Pop music 2015: $\neg M(\text{you}) \wedge \forall x M(x)$, where $M(x) =$ "My momma likes x."

4. Movie soundtrack 2013: $\forall t \leq 0 \neg C(t)$, where $C(t) =$ "The cold bothers me at time t."

5. Literature c. 1600: $\exists u \big(R(u) \wedge D(u) \big)$, where $R(u) =$ "u is rotten" and $D(u) =$ "u is in the

   state of Denmark."

6. Movie soundtrack 2006: $\neg \exists u \big(S(u) \wedge \neg R(u) \big)$, where $S(u) =$ "u is a star in heaven" and

   $R(u) =$ "We can reach u."

7. Musical 1986 and Movie 2014: $\exists x S(x) \wedge \neg \exists y A(y)$, where $S(x) =$ "x is on your side" and

   $A(y) =$ "y is alone."

8. Movie 2001: $\forall x \big(W(x) \Rightarrow \neg L(x) \wedge \neg E(x) \big)$, where $W(x) =$ "x is a wizard," $L(x) =$ "x is

   late," and $E(x) =$ "x is early."

9. Pop music 1987: $\forall t \geq 0 \neg \big(G(\text{give you up}, t) \vee G(\text{let you down}, t) \vee G(\text{run around}, t) \vee$

   $G(\text{desert you}, t) \big)$, where $G(u, t) =$ "I am going to do u at time t."

10. Country music 1990: $\exists x \exists y (F(x) \wedge F(y) \wedge L(x) \wedge L(y) \wedge x \neq y)$, where $F(x) =$ "I am

    friends with x" and $L(x) =$ "x is in low places."

11. Pop music 1990: $\exists t > 0 \exists x \big(T(x, t) \wedge S(x, t) \big)$, where $T(x, t) =$ "At time t, x makes you turn

    around" and $S(x, t) =$ "At time t, x makes you say goodbye."

12. Folk rock music 1965: $\forall u \exists t S(u, t)$, where $S(u, t) =$ "t is the season for u."

13. Pop music 2011: $\neg S(\text{you}) \wedge \forall x \big((x \neq \text{you} \wedge R(x)) \Rightarrow S(x) \big)$, where $S(x) =$ "x can see it"

    and $R(x) =$ "x is in the room."

14. Country music 2010: $(T = 1{:}15) \wedge \neg\big(\exists y \neq I(W(I, y, T))\big) \wedge N(I, \text{you}, T)$, where T is the

current time, $W(x, y, t) =$ "x is with y at time t," and $N(x, y, t) =$ "x needs y at time t."

15. Country music 2015: $\exists t_1 < 0\big(K(I, t_1) \wedge \forall t < t_1 \forall x \neg K(x, t)\big) \wedge \exists t_2 > 0\big(K(\text{she}, t_2) \wedge \forall t >$

$t_2 \forall x \neg K(x, t)\big)$, where $K(x, t) =$ "He kisses x at time t."

16. New wave music 1983: $\forall x\big(F(\text{you}, x) \Rightarrow \neg D(x)\big) \wedge \forall x\big(\neg D(x) \Rightarrow \neg F(I, x)\big)$, where

$F(x, y) =$ "x and y are friends" and $D(x) =$ "x dances."

17. Folk rock music 1972: $p \wedge q \wedge \exists x_1 \exists x_2 \exists x_3 \exists x_4 \exists x_5 \exists x_6 \exists x_7 (\forall i \in J(M(x_i) \wedge W(x_i))$

$\wedge \; \forall i \in J\big(i \leq 4 \Rightarrow O(x_i)\big) \wedge S(x_5) \wedge S(x_6) \wedge F(x_7) \wedge \forall i \in J \forall j \in J(i \neq j \Rightarrow x_i \neq x_j))$,

where $p =$ "I am running down the road," $q =$ "I am trying to loosen my load," $M(x) =$ "x is

on my mind," $W(x) =$ "x is a woman," $O(x) =$ "x wants to own me," $S(x) =$ "x wants to

stone me," and $F(x) =$ "x says that x is a friend of mine." Also, J is the index set

$\{1,2,3,4,5,6,7\}$.

Answers:

1. *The Blues Brothers*.
2. " "Kiss," by Prince.
3. "Love Yourself," by Justin Bieber.
4. "Let It Go," from *Frozen*.
5. *Hamlet*, Act 1, Scene 4.
6. "Breaking Free," from *High School Musical*.
7. "No One Is Alone," from *Into the Woods*.
8. *The Lord of the Rings: The Fellowship of the Ring*.
9. "Never Gonna Give You Up," by Rick Astley.
10. "Friends in Low Places," by Garth Brooks.
11. "Hold On," by Wilson Phillips.
12. "Turn! Turn! Turn!," by the Byrds.
13. "What Makes You Beautiful," by One Direction.
14. "Need You Now," by Lady Antebellum.
15. "I Got the Boy," by Jana Kramer.
16. "Safety Dance," by Men Without Hats.
17. "Take It Easy," by the Eagles.