LESSON MAKER PRO

Conflict-Free Plans

Use colors and matchings to make schedules work.

HIGH SCHOOL · FM.N.A.19

FM.N.A.19 "Use vertex-coloring, edge-coloring, and matching techniques to solve application-based problems involving conflict."

NAME _____ DATE _____

THREE NETWORK TOOLS

Color vertices to put conflicting events in different slots. Color edges to put tasks that share a person in different slots. A matching selects pairs with no person repeated.

WORKED EXAMPLE

Each pair in the table shows events that conflict. Find the fewest slots for W, X, Y, and Z, and assign each event.

CONFLICTING PAIRS

Pair	Pair
WX	XY
YW	YZ

1. W, X, and Y all conflict with one another, so they need three slots.
2. Put W in slot 1, X in slot 2, and Y in slot 3.
3. Z conflicts only with Y, so Z can use slot 1.

Answer: 3 slots: W and Z in slot 1, X in slot 2, Y in slot 3.

PRACTICE 4 problems

1 Conflicting pairs: PQ, QR, RS, SP. Find the fewest slots and assign P, Q, R, and S.

ANSWER _____

2 Conflicting pairs: AB, AC, AD, BC, BD, CD. How many slots are needed?

ANSWER _____

3 Meetings AB, AC, AD, and AE share a person when letters repeat. How many rounds are needed if no person attends two meetings in one round?

ANSWER _____

4 From links AB, AC, BD, CD, choose a largest matching. Give its size and links.

ANSWER _____

APPLY IT Show your work

1 Players cannot play two matches in one round. Schedule the listed matches in the fewest rounds. List each round.

TOURNAMENT MATCHES

Match	Match
JK	JL
KL	LM

ANSWER _____

2 Each student can staff one booth, and each booth needs one student. Use the table to staff as many booths as possible. List the assignments.

BOOTH CHOICES

Student	Can staff
A	Snack, Tickets
B	Snack
C	Tickets, Merch

ANSWER _____

CHALLENGE One step up

Each listed pair of booths conflicts. Find the fewest time slots and explain why fewer cannot work.

BOOTH CONFLICTS

Cycle conflicts	Other conflicts
AB, BC, CD	HA, HB, HC
DE, EA	HD, HE

WORK SPACE AND ANSWER

Conflict-Free Plans

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Conflicting pairs: PQ, QR, RS, SP. Find the fewest slots and assign P, Q, R, and S.	**2 slots: P and R together; Q and S together.**
2	Conflicting pairs: AB, AC, AD, BC, BD, CD. How many slots are needed?	**4 slots**
3	Meetings AB, AC, AD, and AE share a person when letters repeat. How many rounds are needed if no person attends two meetings in one round?	**4 rounds**
4	From links AB, AC, BD, CD, choose a largest matching. Give its size and links.	**Size 2: AB and CD. AC and BD also work.**

PART 2 · APPLY IT

1. **3 rounds: JK and LM; JL; KL.** L plays in three matches, so at least three rounds are needed. JK and LM can share a round.
2. **3 booths: B at Snack, A at Tickets, C at Merch.** These assignments use each student and booth once. Three is the maximum because there are only three students.

CHALLENGE

4 slots. For example, put A and C in slot 1, B and D in slot 2, E in slot 3, and H in slot 4. The five-booth cycle needs at least three slots because alternating two slots around it makes A and E clash. H conflicts with every booth, so it needs a fourth slot.

Accept any valid assignments using the stated minimum number of slots or rounds. For the matching, accept either pair of disjoint links.