What's in a Name? Should we be Calling it a Game? Rethinking Choice, Strategy, and Mathematical Integrity

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Mathematical games are widely used in primary school classrooms, yet the activities that are labelled as "games" vary considerably in their structure, cognitive demands, and potential to support student reasoning. This conceptual paper offers a typology that distinguishes between pseudo-games, superficial games, gamification, and instructionally rich games. Drawing on examples from classroom practice and research literature, we argue that the presence of choice alone does not define a pedagogically effective game. Instead, instructional value depends on the nature of the choices available and their alignment with key mathematical ideas. We propose three design principles that characterise instructionally rich games, with particular emphasis on the role of strategic reasoning, embedded representations, and opportunities for students to make meaningful mathematical connections. This framework is intended to support teachers, researchers, and designers in critically evaluating and developing mathematical games that move beyond surface-level engagement to promote deep, conceptually grounded learning.

Keywords • mathematics teacher education research • mathematical games • instructional design • student agency • conceptual understanding

Introduction

Within the *Encyclopedia of Mathematics Education* (2014), a mathematical game is defined as a pedagogical activity that:

- has specific mathematical cognitive objectives,
- [requires] students to use mathematical knowledge to achieve content-specific goals and outcomes in order to win the game,
- is enjoyable and with potential to engage students,
- is governed by a definite set of rules and has a clear underlying structure,
- involves a challenge against either a task or an opponent(s) and interactivity between opponents,
- includes elements of knowledge, skills, strategy, and luck, and,
- has a specific objective and a distinct finishing point. (Mousoulides & Sriraman, 2014, p. 383, 384).

Mathematical games are often viewed as effective for engaging students (Attard, 2012; Bragg, 2012), fostering more positive attitudes towards mathematics (Nisbet & Williams, 2009; White & McCoy, 2019), and supporting differentiated instruction (Buchheister et al., 2017; Russo et al., 2021). Consequently, it is perhaps not surprising that games are widely used to support mathematics education, particularly in primary school classrooms. For example, we found that 79% of Australian primary teachers use games multiple times per week, with approximately one-third of teachers using games "all the time" (Russo et al., 2021). Despite their frequent usage, the quality of the games used remains variable, both in terms of the depth of the mathematical thinking enabled and opportunities for students to think and act strategically. This reflects, in part, the reality that teachers use games for a wide variety of purposes: from number fact practice to deep conceptual engagement in important mathematical ideas (Swan & Marshall, 2009). This diversity of use is mirrored in the research base, where recent meta-analytic work has shown that games can support both factual and conceptual learning, depending on how they are structured and used (Kacmaz & Dubé, 2022). It is, however, also indicative of the fact that many game-like activities are bundled under the label "game" without further scrutiny and critical reflection.

Interestingly, this overly inclusive and poorly delineated labelling of what constitutes a mathematical game is also very much the case within the research community. We recently completed a review focussed on research into non-digital games (Russo et al., 2024). Of the 32 studies reviewed, approximately one-third (*n* = 11) described activities that were fully and verifiably consistent with the definition of mathematical games outlined earlier. This is arguably more problematic than the loose categorisation of games by teachers, as we might reasonably expect that researchers are careful to ensure that the activities that are labelled as games within a given study are consistent with the established definition—or at least transparently described in relation to it. In our review, we identified several studies that incorporated game-like activities that were mathematical, competitive, and had a clear objective, but did not afford any choice or strategy for players. For example, Skillen et al. (2018) reported on a modified version of *Snakes and Ladders* featuring an enhanced gameboard and adjusted mechanics intended to draw students' attention to the counting-on strategy. However, despite these adjustments, the game remained similar to the original *Snakes and Ladders*, offering no player choice or strategic decision-making, and functioning as a *luck race* (Gough, 1999, 2001).

When mathematically shallow or non-agentic activities are categorised as games, we risk inflating their educational value and eroding the conceptual clarity of game-based pedagogies. For researchers, this raises a fundamental concern—if activities that do not meet core definitional criteria are nonetheless treated as mathematical games in empirical studies, then the conclusions drawn about the affordances of games may not, in fact, be about games at all. This calls into question the integrity of the evidence base and hinders the development of a coherent research agenda in this space. For teachers and teacher educators, the absence of precise terminology makes it more difficult to select, adapt, or design games that meaningfully support reasoning, problem-solving, and conceptual understanding. A more practical and theoretically grounded language for distinguishing types of game-based activity is therefore essential. Here, we use *game-based activity* as a deliberately inclusive term to encompass all tasks that are framed, structured, or experienced as games in mathematics education, including those that may fall short of established definitional criteria.

This conceptual paper presents a typology of game-based activities in primary mathematics education: *pseudo-games*, *superficial games*, *gamification*, and *instructionally rich games*. Drawing on classroom examples and existing literature, the typology Illustrates how these activities vary in the opportunities they offer for student agency and mathematical reasoning. The paper concludes with implications for teachers, researchers, and game designers.

Pseudo-games: Activity Without Agency

Perhaps the most obvious examples of an activity-type that is frequently misclassified as a mathematical game is what Gough (2001) termed "pseudo games" (p. 14). Gough (1999) illustrated this idea through examples of activities that may look like games but lack the essential features of gameplay, particularly player agency. He argued that true games involve two or more players who take turns, make meaningful choices, and compete toward a defined winning condition. *Traditional Bingo*, for instance, is described as failing to meet these criteria; although it involves multiple players and a clear objective, it does not allow players to make decisions that influence the outcome. Players mark off numbers as they are called, with no scope for strategy or interaction. Even though such activities can be engaging, Gough emphasised that they do not constitute genuine games because they offer no opportunity for players to influence the course of play. This clearly distinguishes them from games that support choice, strategy, and responsive decision-making.

An instructive example of this issue can be found in a study by Casey et al. (2020), which involved 162 6–7-year-old girls and their mothers. The authors investigated the relationship between maternal support during a brief home-based card "game" and girls' addition performance at the end of first grade. During the activity, players repeatedly took turns being dealt three number cards each, with the objective in each round being to determine which hand had the higher total. Although the study yielded useful insights into maternal scaffolding during everyday interactions, the activity itself was mathematically superficial and procedurally constrained. The activity afforded no player agency beyond summing the values on randomly dealt cards and declaring a winner, offering little in the way of strategy or decision-making beyond how the players chose to calculate the sum. As such, whereas the broader study contributes to understanding how parents support children's mathematical thinking, the activity itself serves as a clear example of one that fails to meet the core definitional criteria of a mathematical game.

The absence of player agency in pseudo-games is not only a limitation of game design; it undermines opportunities to foster students' motivation and deepen their learning. Drawing on self-determination theory (Ryan & Deci, 2017), we understand autonomy to be a core psychological need that underpins the development of competence and sustained engagement. In mathematics education, supporting student autonomy through structured opportunities for choice can help cultivate ownership over learning, strengthen mathematical identity, and promote resilience when problem solving. Hubbard (2024) highlighted this dynamic in her doctoral research, demonstrating that when autonomy is supported through well-designed mathematical tasks, it can pave the way for increased confidence and competence, even among students who may initially lack belief in their own ability. She further argued that autonomy and competence are not independent needs but deeply intertwined; students are more likely to develop a sense of mathematical capability when they are invited to make purposeful decisions within structured tasks. These insights reinforce the importance of designing mathematical games that offer genuine, mathematically significant choices—not just to satisfy formal definitions of gameplay, but to support students' broader affective and cognitive development.

Superficial Games: Choice Without Depth

Some activities present players with limited or surface-level decision-making and are often mistaken for rich mathematical games because they involve player choice. We refer to these as superficial games. They tend to meet the minimal structural criteria of a game (i.e., rules, competition, objectives, and some agency), but the mathematical reasoning required for gameplay is either procedurally shallow or loosely connected to the intended learning focus. As a result, these games may increase the quantity of mathematical engagement (e.g., frequent calculation) without significantly improving its quality (e.g., reasoning, justification, or strategic reflection). The appeal for these activities often lies in the presence of a visible decision point or interactive component, which can make them appear pedagogically richer than they are.

Consider, for instance, a variant of *Snakes and Ladders* designed to introduce some element of player agency. Rather than rolling a single die, players roll two and select which value to use for their turn. On the surface, this introduces a layer of choice. In practice, the mathematical decision-making remains superficial. A simple rule of thumb is likely to emerge; choose the higher number, unless the lower number avoids a snake or lands on a ladder. While there may be an implicit connection to probability or numerical magnitude, these ideas are not formally developed, discussed, or made mathematically central. The choice, while present, is more about instinctive gameplay than deliberate mathematical thought. Such games risk being miscategorised as "rich" because they contain a decision; however, without intentional design that ties player choices to core mathematical ideas, their instructional value remains limited. In this way, superficial games sit uneasily between pseudo-games and instructionally rich games, not entirely devoid of agency, but not meaningfully shaped by it either.

Gamification: Game Elements Without Gameplay

While pseudo-games and superficial games reflect varying degrees of agency within the structure of gameplay (i.e., no agency and limited agency respectively), a related, but conceptually distinct, phenomenon is gamification. Gamification is commonly defined as the application of game design elements in non-game contexts (Sailer & Homner, 2020). In educational settings, this typically involves overlaying conventional learning activities with external motivators (such as points, badges, levels, or competitive features) designed to increase behavioural engagement, repetition, or effort. Crucially, these additions often enhance the presentation of the activity without meaningfully altering its underlying structure or the kind of mathematical thinking it supports. Gamified activities may appear game-like in form, but they frequently lack the structural integrity of genuine gameplay and offer little or no opportunity for players to make meaningful choices. By *structural integrity of genuine gameplay*, we mean a game's internal coherence, where its rules, goals, and player choices are tightly interwoven with the mathematical ideas targeted, and where progress depends on applying those ideas in strategic ways. The result, in the case of gamification, is often instructional content delivered in a more performative or reward-oriented frame. To distinguish gamification from mathematical games, we propose the criterion of swap-ability. If the core mechanics of an activity remain unchanged when the mathematical content is replaced with material from another domain—such as spelling, geography, or science—it is likely a case of gamification rather than gameplay.

A compelling example of gamification in mathematics education can be found in the work of Karnes et al. (2021), who investigated the impact of a *Racetrack Game* intervention designed to improve single-digit multiplication fluency among struggling students. The activity combined direct instruction flashcards, timed repetition, self-monitoring, and positive reinforcement with a game-like racetrack board. Students progressed around the track by correctly answering multiplication facts, often receiving stickers and encouragement as reinforcement. While the intervention was highly structured and yielded strong improvements in fact recall, the game-like elements were largely motivational rather than mathematical in nature. The racetrack added visual appeal and a sense of competition, but the underlying activity remained a drill-and-practice routine. Players had no opportunity to make strategic decisions, influence the direction of play, or engage in mathematical reasoning beyond recall. Viewed through the lens of our swap-ability criterion, the core structure of the racetrack (i.e., flashcards, timed responses, and external rewards) could easily be applied to spelling words, geography facts, or science definitions without modification. This suggests that, while effective in promoting recall and being behaviourally engaging, the activity constitutes gamification rather than genuine mathematical gameplay, emphasising narrow skill development without choice.

The *Racetrack Game* is not an isolated case. More generally, a particularly common manifestation of gamified activity in mathematics education is what we term recall-driven tasks—fast-paced, competitive activities that reward speed and accuracy in retrieving facts or executing procedures. These include whiteboard "fact races", timed group quizzes, or "fastest-answer-wins" challenges. Although often promoted as fluency-building, such tasks tend to reduce fluency to speed and accuracy, sidelining the flexibility and adaptability that underpin genuine mathematical fluency (Boaler, 2019). The tasks offer no strategic decision-making and minimal opportunity for agency. Like other forms of gamification, these tasks are often characterised by skill without strategy, and performance without reasoning. Even though such tasks may have a place in supporting recall and confidence, particularly when students are encouraged to compete against themselves rather than others (e.g., Karnes et al., 2021), they should not be mistaken for games that develop mathematical reasoning or conceptual understanding.

This critique echoes the concerns raised earlier in relation to pseudo-games. When students are denied meaningful agency, the consequences are not only pedagogical but also motivational. From a self-determination theory perspective (Ryan & Deci, 2017), gamified activities may support competence through repeated success, but often fail to foster autonomy, particularly when external rewards and rigid structures limit opportunities for student-directed decision-making. Sailer and Homner (2020) argued that gamification can enhance motivation only when it is thoughtfully aligned with students' psychological needs, rather than substituting choice with extrinsic incentives. As noted earlier, Hubbard (2024) extended this line of thinking by illustrating how choice-rich mathematical experiences can foster students' emerging sense of competence, especially when autonomy is scaffolded within purposeful and well-structured tasks. To reiterate a core tenet of her thesis, rather than treating autonomy and competence as isolated constructs, Hubbard highlighted their interdependence in shaping students' mathematical dispositions. In this light, gamified activities that are devoid of meaningful choice may not just fail to deepen mathematical understanding, they may also miss the opportunity to cultivate students' sense of themselves as capable, agentic learners.

From Play to Pedagogy: Distinguishing Rich Mathematical Games

The preceding sections introduced three categories of game-based activity—pseudo-games, superficial games, and gamified tasks—each characterised by minimal opportunities for student agency and meaningful mathematical engagement. But what distinguishes game-based activities that are both structurally sound and instructionally powerful? In this section, we present two concrete examples of instructionally rich games: *Colour in Fractions* and *Land Grab*. These illustrate how student choice, mathematical reasoning, and embedded representation can converge to support deep and lasting learning.

A powerful example of an instructionally rich game is *Colour in Fractions*, developed and refined by Clarke and Roche (2010). Played using a pair of specially designed dice and a fraction wall, the game invites students to generate fractions on each roll (e.g., 3/4) and shade in equivalent areas of the wall by combining one or more fractional pieces. Each move requires players to make mathematically substantive decisions: they not only identify equivalent fractions, but also determine which equivalence best supports their strategic progress toward a fully shaded wall. This core decision-making process directly engages students with key ideas such as fraction equivalence and composing and decomposing fractions. Importantly, the game board itself functions as the mathematical representation, with each strip of the wall modelling a whole partitioned into equal parts. This ensures that representations are not only visual but also spatially embedded within the structure of play. The requirement for students to record their decisions (e.g., "I rolled 3/4 and shaded 1/2 + 1/4") further reinforces the connection between action, representation, and symbolic expression. As students play, they naturally encounter improper fractions, grapple with challenges involving equivalence, and develop increasingly sophisticated strategies for completing the board, turning each move into an opportunity for problem-solving and justification. *Colour in Fractions* demonstrates how player agency, when meaningfully embedded in a game's structure, can be harnessed to develop deep and durable mathematical understanding.

A second compelling example of how player agency can deepen mathematical engagement is the game *Land Grab* (also known as *Multiplication Toss* or *Multiplication Paddocks*). In its richer forms, *Land Grab* exemplifies a deep alignment between student choice and core multiplication concepts. The game is played on grid paper using two dice; each roll determines the dimensions of a rectangle (length and width), which the player then shades onto the grid to claim that area. Crucially, player decisions are not incidental; they are structurally and mathematically substantive. For instance, one form of agency arises when students must decide how to orient their array (e.g., 4 × 6 or 6 × 4), reinforcing the commutative property of multiplication. A second, even more powerful layer of choice is introduced when players must strategically break up an array to fit available space on the grid. This move (e.g., splitting 13 × 5 into 10 × 5 + 3 × 5) not only supports gameplay but also enacts the distributive property. The pedagogical power of this mechanic is amplified when students are required to record their rolls and array choices using number sentences, as suggested in *Colour in Fractions* (Clarke & Roche, 2010), further connecting representation, reasoning, and recording. What makes *Land Grab* exceptional is the way in which success in the game hinges on the very mathematical ideas being targeted for instruction. In a similar manner to *Colour in Fractions*, it demonstrates how thoughtful game design can transform choice into a mechanism for purposeful mathematical reasoning, making agency not just present, but central to learning.

Reflecting on these examples, it is apparent that instructionally rich games such as *Colour in Fractions* and *Land Grab* not only meet the structural criteria of mathematical games but also embody key design features that support deep and lasting learning. Drawing from these cases, we identify three principles that can inform the design or adaptation of other games for classroom use. While not all instructionally rich games express each principle in the same way, the strongest designs tend to enact all three in an interconnected manner. The first principle is foundational; the second and third enhance and extend the mathematical value of gameplay:

1. *Strategic agency aligned with mathematical content*: The decisions players make in the game are not peripheral to the mathematics but central to it; player agency is entangled with the learning focus. Consequently, unlike pseudo-games or superficial games where mathematics is incidental, rich games embed strategy directly into mathematical structure. This means that success in the game depends not just on luck or recall, but on thinking mathematically.
2. *Embedded mathematical representation*: The gameboard (and more generally, the game space) functions as a mathematical model in its own right, reinforcing structural and spatial reasoning. Representations are not supplementary but are integral to how the game is played and understood. When students engage with these embedded models, they are invited to reason within and through the representation itself, making abstract ideas more concrete and accessible.
3. *Space for reflection and recording*: When students are encouraged to document their decisions using number sentences or other forms of representation, they consolidate connections between action, visual models, and symbolic expression. This process helps surface and solidify the mathematics within the game, formalising students' reasoning and enabling reflection on the structure of their thinking.

Together, these principles help illustrate why agency alone is not sufficient; it is the quality and mathematical integrity of the choices available to students that determines a game's instructional value. They are intended to build on a practitioner-oriented framework for educationally rich mathematical games (see Russo & Russo, 2020), while offering a more conceptually grounded account of how student agency and mathematical reasoning can be interwoven through gameplay. We suggest that instructional designers and teachers aiming to move beyond surface-level engagement may use these principles as practical touchstones for designing, evaluating, or refining game-based activities. Other examples of instructionally rich games are provided in Appendix A.

Implications for Teacher Educators

As we have established, activities labelled as "games" vary widely—not only in their structure, but also in the depth of mathematical reasoning they afford. This lack of clarity can make it difficult for teachers to critically evaluate which games best support their instructional goals, and why. Without shared criteria, the pedagogical potential of games may be either overstated or overlooked.

The three principles introduced in this paper—strategic agency aligned with mathematical content, embedded mathematical representations, and space for reflection and recording—are designed to support more intentional selection, adaptation, and use of games in the classroom. When teacher educators engage teachers with these principles, they can prompt consideration of how particular features of a game connect to meaningful mathematical activity. This process not only sharpens professional judgment but also brings the mathematics of a task into focus, helping teachers anticipate the types of reasoning a game may elicit, and where students might benefit from additional scaffolding or discussion.

As Sullivan et al. (2014) observed in relation to challenging tasks, reflecting on an activity's design features can help teachers better recognise and respond to moments of difficulty or insight. A similar process applies to game-based pedagogies. By analysing games through the lens of the three principles, teachers can build confidence in identifying opportunities for student reasoning and make more informed decisions about when and how to integrate games into their broader instructional sequences.

To illustrate how the principles can sharpen instructional decision-making, it is helpful to contrast *Land Grab* with a second game, *Choc-chip Cookies* (see Russo et al., 2022). While both games involve players exercising choice as they attempt to maximise their score across multiple rounds and focus on multiplication, they differ in key structural and representational features. In terms of strategic agency, *Land Grab* invites players to make spatially and mathematically driven choices—such as rotating arrays or breaking them apart to fit remaining space on the board—thereby enacting the commutative and distributive properties as part of gameplay. In contrast, *Choc-chip Cookies* involves rolling a die and choosing where to allocate the resulting number on a game board showing groups of cookies, to maximise the total number of choc-chips. While this invites some strategic thinking, the decision-making is guided more by numerical reasoning than by engagement with specific multiplicative structures. Regarding embedded representation, *Land Grab* uses rectangular arrays as its game space, reinforcing structural models of multiplication based on area. *Choc-chip Cookies*, by contrast, uses a groups-of model, where multiplication is represented as repeated sets (e.g., 5 cookies with 15 choc-chips each). This supports emergent multiplicative reasoning but does not readily afford exploration of commutativity through gameplay. Finally, in terms of space for reflection and recording, *Choc-chip Cookies* may offer particularly rich opportunities: students often draw on decomposition strategies (such as expressing a group of 19 as 20 − 1 or 15 + 4) to support their calculation, and these methods can surface diverse and flexible approaches to structuring number. In *Land Grab*, recording is more structured and procedural: players typically write number sentences or equations to reflect the area they have claimed. While this supports recognition of the distributive property and links gameplay to formal representations, it is less open-ended and organic than the recording observed in *Choc-chip Cookies.* This contrast underscores how the three principles can help teachers and teacher educators move beyond general notions of engagement to consider the specific kinds of reasoning different games afford, and how they might be best positioned within an instructional sequence.

To further support this work in both classrooms and professional learning contexts, the following questions can help teacher educators scaffold reflection on the use of mathematical games. Whether working with pre-service teachers or in-service teachers, these questions can guide collaborative evaluation, selection, and design of games that are instructionally rich.

Strategic agency aligned with mathematical content

- Does the game allow for meaningful player decision-making that shapes the gameplay? (For example, games that offer rich strategies where players actively influence the outcome through their choices.)
- Do the meaningful decisions required by the game directly engage students with core mathematical ideas? (For example, games where strategic decisions require students to apply, reason about, or manipulate key mathematical concepts.)

Embedded mathematical representations

- Is the game board or the core game structure itself an important mathematical representation? (For example, games that use arrays, number lines, geometric grids, or other representations central to the mathematical idea.)
- Does the gameplay require students to engage with, use, or interpret important mathematical representations? (For example, games where students actively work with area models, equations, diagrams, or other key representations during play.)

Space for reflection and recording

- Are students required to record, discuss, or reflect on their mathematical thinking during or after gameplay? (For example, games that build in opportunities for students to make their thinking visible through recording or structured discussion.)

- Do the recording, discussion, or reflection opportunities support students to make connections between different mathematical representations? (For example, games that prompt students to link visual, symbolic, and concrete representations to consolidate mathematical understanding.)

While the questions above are designed to support teachers and mathematics leaders in evaluating the instructional value of games, the language we use to describe different types of games can also influence how teachers engage with these distinctions in practice. In our work with teachers, we have sometimes introduced alternative, practitioner-friendly labels to help scaffold reflective conversations about the types of games used in mathematics classrooms. For example, we often describe pseudo-games as *Pinocchio games*. These are activities that "want to be real games" but lack the essential animating feature of genuine games: player choice. We refer to superficial games as *mathematically light games*, recognising that while these games are light on reasoning, they may still hold value, particularly for supporting fluency. Finally, we describe instructionally rich games as *mathematically integrated games* to highlight that these games tightly weave strategic play and key mathematical ideas together. We have found that this accessible language encourages teachers to evaluate critically the game-based activities they use, without discounting the potential value of a broad range of game-based activities in the classroom.

Concluding Remarks

In this paper, we have argued that not all so-called mathematical games are created equal. By distinguishing between pseudo-games, superficial games, gamified activities, and instructionally rich games, we offer a more nuanced framework for evaluating the pedagogical value of game-based activities in mathematics education. Our central claim is that the presence of choice alone is insufficient; it is the quality of that choice, particularly its entwinement with mathematical reasoning that determines a game's instructional potential. This perspective invites a re-examination of how games are selected, adapted, and designed in both classroom and research settings. For teachers, it offers practical criteria for elevating game-based learning that goes beyond surface engagement. For teacher educators, it offers a framework for engaging preservice and in-service teachers in both critical reflection on resource selection and professional conversations about enhancing pedagogical practice. For researchers, it provides a language to more rigorously analyse and describe the affordances and limitations of different game-based activities. And for game designers, it emphasises the power of weaving strategic mathematical decision-making into the heart of gameplay. As the use of games in mathematics classrooms continues to grow, we hope this typology contributes to a more thoughtful and analytically robust conversation about what it means for a game to be not only engaging, but also instructionally rich. Future research might explore how these ideas play out in real classrooms, investigating how students experience these different game types and how teachers and teacher educators interpret and apply the model in practice.

While the design and selection of instructionally rich games are essential, it is important to acknowledge that the quality of implementation also shapes the mathematical learning opportunities that arise during gameplay. Previous research has shown that teacher-student interactions during games are not always instructionally productive, with some studies reporting limited mathematical discussion and an overemphasis on rules and game management (Heshmati et al., 2018). Emerging evidence, however, suggests that some teachers are able to capitalise on the affordances of well-designed games, facilitating high-quality interactions that promote mathematical reasoning and connection-making (Cezarotto et al., 2024; Cusi & Morselli, 2025; Debrenti & Bella, 2025). Supporting teachers to notice and pursue these opportunities during gameplay represents a valuable complementary focus for future research and professional learning.

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Appendix A

Table 1
Examples of Instructionally-rich Games

Game	Brief Description	Strategic Agency	Embedded representation	Reflection and Recording
Part-whole Triangles	Players begin by arranging six playing cards into a triangle formation. On each turn, they draw and swap cards from a central pile to try to complete a structure where the two lower numbers in each triangle sum to the number above. Players may rearrange cards at any time to improve their chances. The first to form a fully correct part–whole triangle wins the round.	Players must select which numbers to place and where, requiring forward planning and logical deduction based on additive structures.	The triangle structure explicitly represents part-part-whole relationships, making composition and decomposition of numbers visible.	Players are required to explain combinations used and can record these as number sentences (e.g. 5 + 8 = 13), reinforcing conceptual links between action, structure, and symbolic reasoning.
Closest to X	Players begin with a shared number sentence structure containing multiple blanks and operations. On each turn, a die is rolled, and players must strategically decide where to place the rolled digit in their own version of the number sentence. Once all blanks are filled, players evaluate their expressions using the order of operations. The player whose result is closest to the target number wins.	Players must evaluate multiple options and apply probabilistic and relational reasoning to make strategic decisions based on the digits and operations available.	The gameboard takes the form of a partially completed number sentence, which students complete by strategically placing digits.	Students record their mathematical thinking through the process of completing the number sentence, while at the conclusion of the game, students are expected to calculate and justify their result.
Skip-counting Bingo	Players take turns selecting numbers from a number chart. A die is rolled to generate a skip-counting sequence (e.g., by 4s), and players count from zero until they reach one of their selected numbers, which is then removed. The die is rolled again, and play continues until one player has removed all their counters.	Players strategically select their "bingo" numbers to maximise chances of removal across diverse counting sequences.	The number-chart serves as the gameboard, visually supporting skip-counting and emerging multiplicative thinking by helping students recognise multiples and identify number patterns.	Students can record the path of each counting sequence on the number-chart, enabling them to visualise patterns and compare sequences. Prompts also support reflection on number choices and generalisations about multiples.

Note: Full descriptions of the games are available at www.surfmaths.com/games