



Co- funded by the European Union

Knowledge and Pratice Standards Number Sense WG Corin Mathews, Lise Westeway, Zain Davis



Knowledge and Practice Standards (KPS) 9 to 17



In the FP and IP additive relations points us to the relationship between addition and subtraction. The distinction between FP and IP is the number range and strategies that the learners are expected to work with. A pre-service teacher should be able to understand the following:

Representations	Strategies and Fluencies	Instructional Discourse		Foundational Concepts Standards	
 objects diagrams words (less and more) number track beadstring number line number chart p-p-whole diagram Dienes blocks base-5 and base- 10 reps (5-frame, 10-frame, abacus, arithmetic rack) 	 Fluencies number facts adding and subtracting 10 to/from any number adding and subtracting tens and hundreds adding a single digit to a decuple (e.g. 30+7=□) adding up to a decuple (e.g. 34+□ =40) subtracting a single digit from a decuple (e.g. 50 - 6 = □) subtracting to a decuple (e.g. 78 - □ =70) Strategies counting using known facts (bonds) bridge-through-ten jump strategies (N10) split strategies (1010) compensation 	 SAY speak about addition as a combination of two sets to produce a combined set, and also as increasing a starting quantity by a certain amount refer to subtraction as take away and difference: starting with a collection, taking away from it and being left with a smaller collection, and also as making a comparison between two amounts additive property – the quantity represented by the whole numeral is the sum of the values of the individual digits (e.g. 36 is the sum of 30 and 6) additive reasoning speaks about how quantities are related in terms of <i>how much more or less.</i> 	 DO demonstrate addition as 'forward' jumps on a number track or number line and subtraction as 'backward' jumps present different types of bare calculations and word problems: join, separate, part- part-whole and compare (the names for the different problem types do not have to be mentioned or explained to learners) vary the position of the 'unknown', that is, start unknown, change unknown and result unknown 	 WRITE record addition as 'forward' jumps on a number track or number line and subtraction as 'backward' jumps calculations can be recorded using number sentences (or the column algorithm) in symbolic form – these can also be recorded as jumps on a number line flow diagrams and arrow notation can also be used to represent additive reasoning 	Aggregates, counting, parts and whole, sets and set relations, number system, relations and fractions, equivalence and order relations, operations as function, computational structures, structure preservation and representations.

Sub-Standards of the Number sense Knowledge and Practice Standards



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	 Strategies counting using known facts (bonds) bridge-through-ten jump strategies (N10) split strategies (1010) compensation 	 quantity represented by the whole numeral is the sum of the values of the individual digits (e.g. 36 is the sum of 30 and 6) additive reasoning speaks about how quantities are related in terms of <i>how</i> <i>much more or less.</i> talk about the inverse 	 vary the position of the 'unknown', that is, start unknown, change unknown and result unknown 	additive reasoning	

Curriculum Content Sub- Standards – Refers to the teaching curriculum content for Foundation and Intermediate Phase

Understand counting as a fundamental mediating resource used to relate operations on aggregates to the basic arithmetic operations.

Understand the use of additive relations in the teaching of addition and subtraction of natural numbers.

Teachers should know addition and subtraction problem types and the range of representations, calculation strategies and tasks used to solve addition and subtraction problems.

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 Representations objects diagrams words (less and more) number track beadstring number line number chart p-p-whole diagram Dienes blocks base-5 and base-10 reps (5-frame, 10-frame, abacus, arithmetic rack) 	FluenciesFluencies• number facts• adding and subtracting 10 to/from any number• adding and subtracting tens and hundreds• adding a single digit to a decuple (e.g. $30+7=$)• adding up to a decuple• (e.g. $34+$ = 40)• subtracting a single digit from a decuple (e.g. $50 - 6 =$)• subtracting to a decuple (e.g. $78 -$ =70)Strategies 	SAY • speak about addition as a combination of two sets to produce a combined set, and also as increasing a starting quantity by a certain amount • refer to subtraction as take away and difference: starting with a collection, taking away from it and being left with a smaller collection, and also as making a comparison between two amounts • additive property – the quantity represented by the whole numeral is the sum of the values of the individual digits (e.g. 36	DO demonstrate addition as 'forward' jumps on a number track or number line and subtraction as 'backward' jumps present different types of bare calculations and word problems: join, separate, part- part-whole and compare (the names for the different problem types do not have to be mentioned or explained to learners) vary the position of the 'unknown', that is, start unknown,	 WRITE record addition as 'forward' jumps on a number track or number line and subtraction as 'backward' jumps calculations can be recorded using number sentences (or the column algorithm) in symbolic form – these can also be recorded as jumps on a number line flow diagrams and arrow notation can also be used to represent additive reasoning 	
	 using known facts (bonds) bridge-through-ten jump strategies (N10) split strategies (1010) compensation 	 Individual digits (e.g. 36 is the sum of 30 and 6) additive reasoning speaks about how quantities are related in terms of <i>how much more or less</i>. talk about the inverse 	start unknown, change unknown and result unknown		

Pedagogical Sub-Standards

2 Refer to O contexts used for posing tasks, for supporting ^O learners' **P** reasoning about a task and for classroom discussions.

Refers to the 'instant and accurate' manner of responding to a mathematical calculation or procedure

Referred to as strategies or methods

Pedagogical Sub-Standards

Instructional Discourse Encompasses actions and inscriptions

natural language,

SAY

This details the nature of teacher talk to be used in the class which needs to cohere with the other elements of *'instructional* discourse'

00 This unpacks the demonstrable actions teachers should be engaged in while teaching the KPS's.

Write This outlines the micro-content related to teachers' inscriptions during teaching of the KPS's.

Pedagogical Sub-Standards

Representations	Fluencies and Strategies	Instructional Discourse
 objects diagrams words (less and more) number track beadstring number line number chart p-p-whole diagram Dienes blocks base-5 and base-10 reps (5-frame, 10-frame, abacus, arithmetic rack) 	Fluenciesnumber factsadding and subtracting 10 to/fromany numberadding and subtracting tens andhundredsadding a single digit to a decuple(e.g. $30+7=\Box$)adding up to a decuple(e.g. $34+\Box=40$)subtracting a single digit from adecuple(e.g. $50-6=\Box$)subtracting to a decuple(e.g. $78-\Box=70$)Strategiescountingusing known facts (bonds)bridge-through-tenjump strategies (N10)split strategies (1010)compensationcolumn algorithmdoublingnear doubleshalving	 SAY Speak about addition as a combination of two sets to produce a combined set, and also as increasing a starting quantity by a certain amount. refer to subtraction as take away and difference: starting with a collection, taking away from it and being left with a smaller collection, and also as making a comparison between two amounts. additive property - the quantity represented by the whole numeral is the sum of the values of the individual digits (e.g. 36 is the sum of 30 and 6). additive reasoning speaks about how quantities are related in terms of how much more or less. talk about the inverse relation between addition and subtraction (which means that

one action

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 number chart adding a single digit to a decuple (e.g. 30+7=□) adding up to a decuple (e.g. 34+□=40) adding up to a decuple (e.g. 54-frame, 10 reps (5-frame, 10 reps (5-frame, abacus, arithmetic rack) subtracting to a decuple (e.g. 78 -□ =70) subtracting a single digit to a decuple (e.g. 78 -□ =70) counting using known facts bonds) split strategies (N10) split strategies (N10) split strategies (N10) split strategies (N10) 	 diagrams words (less and more) number track beadstring number line number chart p-p-whole diagram Dienes blocks base-5 and base-10 reps (5-frame, 10-frame, abacus, 	 Fluencies number facts adding and subtracting 10 to/from any number adding and subtracting tens and hundreds adding a single digit to a decuple (e.g. 30+7=□) adding up to a decuple (e.g. 34+□ =40) subtracting a single digit from a decuple (e.g. 50 - 6 = □) subtracting to a decuple (e.g. 78 - □ =70) Strategies counting using known facts (bonds) bridge-through-ten jump strategies (N10) 	 speak about addition as a combination of two sets to produce a combined set, and also as increasing a starting quantity by a certain amount refer to subtraction as take away and difference: starting with a collection, taking away from it and being left with a smaller collection, and also as making a comparison between two amounts additive property – the quantity represented by the whole numeral is the sum of the values of the individual digits (e.g. 36 is the sum of 30 and 6) additive reasoning speaks about how quantities are 	 demonstrate addition as 'forward' jumps on a number track or number line and subtraction as 'backward' jumps present different types of bare calculations and word problems: join, separate, part- part-whole and compare (the names for the different problem types do not have to be mentioned or explained to learners) vary the position of the 'unknown', that is, start unknown, change unknown and 	 record addition as 'forward' jumps on a number track or number line and subtraction as 'backward' jumps calculations can be recorded using number sentences (or the column algorithm) in symbolic form – these can also be recorded as jumps on a number line flow diagrams and arrow notation can also be used to represent 	Aggregates, counting, parts and whole, sets and set relations, number system, relations and fractions, equivalence and order relations, operations as function, computational structures, structure preservation and

12 Foundational Concepts Sub-Standards



Foundational Concepts Sub-Standards

 Aggregates, counting, parts and wholes, sets and set relations, number system, relations and fractions, equivalence and order relations, operations as function, computational structures, structure preservation and representations.

Foundational Concepts Sub-Standards

Parts and wholes: Knowledge of parthood, part-whole relations, part-whole operations, and part-whole partitions.

Whole				
Part	Part			
1	0			
8	2			
8+2=10	10=8+2			
2+8=10	10=2+8			
10-2=8	8=10-2			
10-8=2	2=10-8			