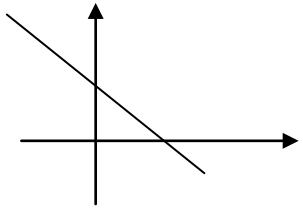
Concepts

Key Ideas	Questions (general)	Examples (specific)	Possible Student Responses
Meanings, definitions, representations	C1: What does … mean? (Separate meaning from rule.)	What is the highest common factor (HCF) of two numbers?	C: The largest number that can divide the two numbers evenly (without remainder). W: The larger of the two given numbers. W: Explain the "division" method to find HCF.
	C2: Show … on a diagram.	Show the value of c on the graph of $y = mx + c$. 	C: Mark the point $(0, c)$. W: Mark other points, e.g., x-intercept.
Examples, non-examples, facts	C3: Give me an example of … Another example, another one …	Give me an example of a quadratic equation.	C: Any correct equation. W: Quadratic expression instead of quadratic equation. Q: What about $y = 2x^2 + x - 3$; equation of a quadratic function?
	C4: Give me an example that is not of …	Give me an example that is not a quadratic equation.	C: W:
Connections	C5: How is … similar to (different from) … ?	How is a rhombus different from a square?	C: W:

Skills (Methods)

Key Ideas	Questions (general)	Examples (specific)	Possible Student Responses
Steps, procedures	S1: What is the formula for …?	What is the formula for sin 2*A*? (May be useful for students to memorise important formulae instead of looking them up from formula list.)	C: 2sin *A* cos *A* W: 2sin *A*
	S2: What is the first step? Next step? How do you begin? (To avoid student tendency to think of just *any* formula to solve a problem, ask them questions about what to find before asking this question.)	Prove the identity: tan x + cot x = (sec x)(cosec x)	C: W:
	S3: What are the missing steps? (How many intermediate steps are required?)	What is the gradient of the line with equation $3x - 4y + 5 = 0$. Answer: 3/4	C: W:
Conditions of use	S4: What are the conditions for applying … ? Have you checked them?	Before you use Pythagoras Theorem, what must you check first?	C: Right-angled triangle; given sides must be for the same triangle. W:

Processes

Key Ideas	Questions (general)	Examples (specific)	Possible Student Responses
Reasoning, inductive justification, deductive proofs	P1: How do you know this is true? (How do you convince others that this is true? Why do you believe in …?)	A parallelogram is *not* a rectangle? Why?	C: W:
	P2: Why do you use …? (Could be under Skills)	You use Sine rule to solve this problem. Why?	C: W:
Communication	P3: What is the correct word or symbol for …? (Could be under Concepts)		C: W:
	P4: Explain what you are doing here … (in your own words) (Could be under Skills)		C: W:
Applications	P5: What maths can be used in this real-life context …?	As a reporter, you want to show the number of litterbugs caught in the past five years. How?	C: W:

Metacognition

Key Ideas	Questions (general)	Examples (specific)	Possible Student Responses
Monitor problem solving process, unstuck	M1: What does … remind you of?	Solve: $x^2 - 3x = x - 3$. What does this remind you of?	C: Solve quadratic equation with zero on one side. W: Solve equation by cancelling factors.
	M2: If you continue to do this, do you think you are on the right track? (Encourage students to re-read question.)		C: W:
	M3: What heuristic would you try when you are stuck?	Three people were at a coffee shop. There were 20 sugar cubes. Each person put an odd number of cubes in his cup. They used all 20 sugar cubes. How many cubes did each person use? (modified from Zazkis & Liljedahl, p. 80)	C: W:
Look back, make sense, extend	M4: Does the answer make sense? (Students need to know about real-life contexts.)	The average of 24 and 26 is 35. Does this make sense?	C: Answer should be between 24 and 26. W: This is what I get from calculator (copy wrongly?)
	M5: What would you do if … is changed?	A restaurant gives a discount equal to the age of the paying customer. If the bill is $250 and the paying customer is 40 years old, how much is the discount? What is the discount if the paying customer is 60 years old? 110 years old?	C: W:
Self-regulated learning	M6: How would you avoid similar mistakes?		C: W:

Attitudes

Key Ideas	Questions (general)	Examples (specific)	Possible Student Responses
Motivation	A1: What motivate you to persevere in tackling difficult problems? (Learn something about students' beliefs; M_Creat model)		P: N:
Enjoyment	A2: Did you enjoy learning this topic? Why?		P: N:
	A3: Do you like this story about …?		P: N:
Confidence, self-efficacy	A4: Do you feel more confident after you had solved a challenging problem?		P: N:

Questioning Sequence: Consecutive Numbers: Algebraic Method

Find 3 consecutive numbers that add up to 60.

Steps & Purposes	Instructions & Questions	Possible Student Responses
Concepts	• What does “consecutive numbers” mean? • Give	
Skills	• We are going to solve this using algebra. • In algebra method, what is the first thing to think of?	
Metacognition	• Does your answer satisfy the condition? [check] • Can	
Attitude	• Do you	

Q&A: Consecutive Numbers: Logical Argument

Find 3 consecutive numbers that add up to 60.

Steps & Purposes	Instructions & Questions	Possible Student Responses
Concepts	• What does “consecutive numbers” mean? •	
Reasoning	• They add up to 60. •	
Metacognition	• Does your answer satisfy the condition? [check] •	
Attitude	• Do you	