

Mathematics Level 6

Review 1 - Number and Algebra

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End-of-year review

Review R1 — Number and Algebra · End-of-year review · 30 marks · Chapters 1–4

Assesses: all 12 content descriptions of the Number and Algebra strands, sampled from work already assessed in chapter tests T1–T4 — Number (VC2M6N01, VC2M6N02, VC2M6N03, VC2M6N04, VC2M6N05, VC2M6N06, VC2M6N07, VC2M6N08, VC2M6N09) and Algebra (VC2M6A01, VC2M6A02, VC2M6A03). **Total: 30 marks.**

This is a school-designed paper. It is not a VCAA instrument. Achievement in the Victorian Curriculum is reported against the Level 6 achievement standard, not against a mark on this paper.

Teacher note. This is a classroom check, not an exam. It is cumulative: every item draws on content already taught and assessed in Chapters 1–4, and there is no new content. It checks what students retain before they move on, and with R2 it is the Year 6 exit check and the readiness check for the Level 7 book. Each question is tagged with its content description code in the marking guide, so marks can be read diagnostically against the achievement standard.

This review looks back at the Number and Algebra work from Chapters 1 to 4. There are 12 questions, worth 30 marks altogether. Nothing in it is new — every question is about something you did this year. Show your working, so your teacher can see what you know.

Timing. Guidance time: 35 minutes (about 1 minute per mark, plus 5 minutes reading). The paper may be split across two sittings — Section A in one sitting and Section B in another.

Equipment. A pencil and paper. No other equipment is needed for this paper.

Calculators. Do not use a calculator for Question 6 — the content it assesses says *without a calculator* (VC2M6N06). You may use a calculator for Questions 7 and 9 if your teacher agrees, because VC2M6N07 and VC2M6N09 allow digital tools — but the numbers are friendly, and you do not need one. Do not use a calculator for any other question.

Section A — Number (20 marks)

These questions draw on Chapters 1 to 3.

Q1. (a) Write each situation as an integer. [1]

- (i) The cake stall at the school fete makes a profit of \$35.
- (ii) A snorkeller is 4 metres below sea level.
- (b) Put these integers in order, smallest to largest: 3, –6, 7, 0, –1. [1]
- (c) Point P is 5 steps left of the origin and 2 steps up on the Cartesian plane. Write the coordinates of P, and name the quadrant P sits in. [1]

Q2. (a) One of these numbers is prime and the other is composite: 23, 39. Which is which? Give one factor of the composite number to support your answer. [1]

- (b) Which square number sits between 20 and 30? How do you know? [1]

Q3. (a) Put these fractions in order, smallest to largest: $\frac{2}{3}$, $\frac{1}{4}$, $\frac{5}{6}$, $\frac{1}{2}$. Give a reason for your order. [1]

- (b) Find the missing number: $\frac{3}{4} = \frac{\square}{12}$. [1]

Q4. Two pieces of ribbon are 4.37 m and 2.85 m long.

- (a) Work out the total length. [1]
- (b) Round each length to the nearest whole number of metres, estimate the total, and use your estimate to check that your answer to part (a) is reasonable. [1]

Q5. Work out. Give each answer in simplest form.

(a) $\frac{5}{6} - \frac{1}{2}$ [1]

(b) $2\frac{1}{4} + \frac{2}{3}$ [1]

Q6. Do not use a calculator. Work out, and show how place value does the work.

(a) 3.8×30 [1]

(b) $8.4 \div 40$ [1]

Q7. (a) Find $\frac{3}{5}$ of 45. [1]

(b) Find 15% of \$60. Show how you built 15% from the big percentages you know. [1]

(c) A toy shop has 20% off all skateboards. The full price of one skateboard is \$45. Find (i) the discount and (ii) the sale price. [1]

Q8. Mia's family buys 4 tickets to a show. Each ticket costs \$9.90.

(a) Round to a friendly number and estimate the total cost. [1]

(b) The exact cost is \$39.60. Give a low estimate and a high estimate for the cost of the 4 tickets, and explain why the exact answer must be between them. [1]

Q9. Zane is saving for a game that costs \$56. He already has \$20, and he saves \$6 of his pocket money each week.

(a) Formulate and solve: how many weeks will it be before Zane has enough? [1]

(b) Interpret and justify: answer the question in words, and show that your answer makes sense — check by going back, or compare with an estimate. [1]

Section B — Algebra (10 marks)

These questions draw on Chapter 4.

Q10. A matchstick pattern grows like this:

Term number	1	2	3	4
Number of matches	5	9	13	17

(a) How many matches does term 5 use? [1]

(b) Write the next-term rule in words. [1]

(c) An any-term rule for this pattern is *multiply the term number by 4, then add 1*. Check that the rule works for term 3, then use it to find term 10. [1]

Q11. (a) Find the unknown: $72 \div 9 + \square \times 4 = 28$. [1]

(b) Find the unknown: $(\square - 3) \times 5 = 35$. [1]

(c) Find **every** pair of natural numbers that makes this equation true: $4 \times \triangle + \square = 14$. [1]

Q12. Here is an algorithm.

1. Start at 20.
2. Is the number even? If **yes**, halve it. If **no**, add 1.
3. Write down the new number.

4. If the number is 1, **stop**. If not, go back to step 2.

(a) Trace the algorithm. Copy and complete the table — the first two passes are done for you. [2]

Pass	Number	Even?	Step taken	New number
1	20	yes	halve	10
2	10	yes	halve	5
3	5	—	—	—
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—

(b) A different algorithm checks the numbers 1 to 20 in order and writes down only the numbers that are **both** multiples of 3 **and** odd. Write the set of numbers this algorithm generates. [1]

(c) In your trace from part (a), the numbers mostly get smaller, but there are two rises: $5 \rightarrow 6$ and $3 \rightarrow 4$. Explain why every rise must be followed by a fall. [1]

Marking guide

This is a classroom check, not an exam. There are **30 marks**. Award the marks below for the responses described; accept any correct method unless a question says otherwise. The wording in brackets after each question is the achievement-standard extract carried on that content description in the authority file, quoted verbatim, so a teacher's judgement maps to VCAA wording without translation.

Strand	Questions	Marks
Number	Q1–Q9	20
Algebra	Q10–Q12	10
Total		30

Q1 — VC2M6N01 — 3 marks. (*students use integers to represent points on a number line and on the Cartesian plane.*) (a) +35 and -4 [1]. Both must be correct for the mark. Accept 35 with no plus sign for the profit; the minus sign is required for -4 — a bare 4 for the snorkeller is incorrect, because the sign carries the direction from zero. (b) -6, -1, 0, 3, 7 [1]. (c) (-5, 2) and the top-left quadrant [1]. Accept (-5, +2). The signs (-, +) place P in the top-left quadrant; award the mark only when both the coordinates and the quadrant are correct.

Q2 — VC2M6N02 — 2 marks. (*They solve problems using the properties of prime, composite, square and triangular numbers.*) (a) 23 is prime and 39 is composite [1], with a factor of 39 named: 3 or 13 ($39 = 3 \times 13$). Accept a reason in terms of factors: 23 has exactly two factors, 1 and 23; 39 has more than two. (b) 25 [1], with the reason: $25 = 5 \times 5$, a number times itself.

Q3 — VC2M6N03 — 2 marks. (*Students order common fractions, giving reasons, and add and subtract fractions with related denominators.*) (a) $\frac{1}{4}, \frac{1}{2}, \frac{2}{3}, \frac{5}{6}$, with a checkable reason [1]. The taught reason writes all four in twelfths — $\frac{3}{12}, \frac{6}{12}, \frac{8}{12}, \frac{10}{12}$ — and reads the top numbers. Accept a correct benchmark argument (for example $\frac{1}{4} < \frac{1}{2}$, and $\frac{2}{3}$ and $\frac{5}{6}$ are each more than $\frac{1}{2}$, with those two then compared). A correct order with no reason earns no mark — the content description says *justify their order*. (b) $\square = 9$ [1]: top and bottom $\times 3$.

Q4 — VC2M6N04 — 2 marks. (*They use all 4 operations with decimals and connect decimal representations of measurements to the metric system.*) (a) 7.22 m [1]. Award the mark for the correct answer; look for the renaming in the working — 7 hundredths + 5 hundredths is 12 hundredths, renamed as 1 tenth and 2 hundredths. The units may be omitted, but the decimal point must be correctly placed. (b) 4.37 rounds to 4 and 2.85 rounds to 3, so the estimate is $4 + 3 = 7$; 7.22 is close to 7, so the answer is reasonable [1]. Award the mark for the rounded estimate and a statement that compares 7.22 with it.

Q5 — VC2M6N05 — 2 marks. (*Students order common fractions, giving reasons, and add and subtract fractions with related denominators.*) (a) $\frac{1}{3}$ [1]: rename $\frac{1}{2}$ as $\frac{3}{6}$; $\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$; simplest form is $\frac{1}{3}$. The question asks for simplest form, so $\frac{2}{6}$ alone earns no mark. (b) $2\frac{11}{12}$ [1]: the lowest common denominator of 4 and 3 is 12; $2\frac{1}{4} = 2\frac{3}{12}$ and $\frac{2}{3} = \frac{8}{12}$, so $2\frac{3}{12} + \frac{8}{12} = 2\frac{11}{12}$.

Q6 — VC2M6N06 — 2 marks. (*They use all 4 operations with decimals and connect decimal representations of measurements to the metric system.*) No calculator for this question. (a) 114 [1]: split 30 as 3×10 , so $3.8 \times 3 = 11.4$, then $\times 10$ shifts every digit one place left: 114. (b) 0.21 [1]: split 40 as 4×10 , so $8.4 \div 4 = 2.1$, then $\div 10$ shifts every digit one place right: 0.21. The 0 in 0.21 is a placeholder and must appear. Award each mark for the correct value with working that shows the single-digit step and the place-value shift. Accept shift language about the **digits**; an answer that only says “move the decimal point” does not show the place-value reasoning this content description assesses (VC2M6N06.E03).

Q7 — VC2M6N07 — 3 marks. (Students solve problems involving finding a fraction, decimal or percentage of a quantity and use estimation to find approximate solutions to problems involving rational numbers and percentages.)

(a) 27 [1]: $\frac{1}{5}$ of 45 is $45 \div 5 = 9$, and $\frac{3}{5}$ is $3 \times 9 = 27$. (b) \$9 [1]: 10% of \$60 is \$6; 5% is half of that, \$3; $15\% = 10\% + 5\% = \$6 + \$3 = \$9$. Award the mark for the building steps, not just the value. (c) (i) discount \$9; (ii) sale price \$36 [1]. 20% of \$45 is $2 \times 10\%$, and 10% is \$4.50, so the discount is \$9; the sale price is $\$45 - \$9 = \$36$. Both values must be correct for the mark.

Q8 — VC2M6N08 — 2 marks. (Students solve problems involving finding a fraction, decimal or percentage of a quantity and use estimation to find approximate solutions to problems involving rational numbers and percentages.)

(a) About \$40 [1]: \$9.90 rounds to the friendly number \$10, and $4 \times \$10 = \40 . (b) Low estimate $4 \times \$9 = \36 ; high estimate $4 \times \$10 = \40 [1], with the explanation: rounding everything down gives less than the exact answer, and rounding everything up gives more, so the exact cost must be between \$36 and \$40. Award the mark for both bounds and a reason of that shape; the exact value \$39.60 does not need to be restated.

Q9 — VC2M6N09 — 2 marks. (They use mathematical modelling to solve financial and other practical problems involving percentages and rational numbers, formulating and solving the problem, and justifying choices.) (a) 6 weeks [1]. Award the mark for a formulation and a solution: the gap is $\$56 - \$20 = \$36$, and $\$36 \div \$6 = 6$. Accept the formulation in words (“find the gap, then share it over \$6 weeks”) or as a number sentence. (b) A sentence in terms of the situation plus a check [1]: for example, “Zane will have enough after 6 weeks”, checked by going back — $6 \times \$6 = \36 , and $\$36 + \$20 = \$56$ ✓ — or compared with an estimate. A bare “6” with no sentence and no check earns no mark for this part: the cycle requires the interpretation and the justification.

Q10 — VC2M6A01 — 3 marks. (They identify and explain rules used to create growing patterns.) (a) 21 matches [1]: $17 + 4 = 21$. (b) Start at 5 and add 4 each time [1]. Accept any wording that names the start and the constant change. (c) Check: term 3 is $3 \times 4 + 1 = 13$, which matches the table ✓; term 10 is $10 \times 4 + 1 = 41$ [1]. Award the mark for the checked rule and 41.

Q11 — VC2M6A02 — 3 marks. (Students find unknown values in numerical equations involving combinations of arithmetic operations.) (a) $\square = 5$ [1]: $72 \div 9 = 8$ first, so $8 + \square \times 4 = 28$; undo the + 8 to get $\square \times 4 = 20$; undo the $\times 4$ to get $\square = 5$. (b) $\square = 10$ [1]: undo the $\times 5$ to get $\square - 3 = 7$; undo the $- 3$ to get $\square = 10$. (c) Three pairs: $(\triangle, \square) = (1, 10)$, $(2, 6)$, $(3, 2)$ [1]. Award the mark for all three pairs. Look for the completeness argument: if $\triangle = 4$, then $\square$ would have to be $14 - 16$, less than 0 — not a natural number — so the list stops.

Q12 — VC2M6A03 — 4 marks. (They design and use algorithms to generate sets of numbers, using a rule.) (a) Pass 3: 5, no, add 1, $6 \div$ Pass 4: 6, yes, halve, $3 \div$ Pass 5: 3, no, add 1, 4 [1]. Pass 6: 4, yes, halve, $2 \div$ Pass 7: 2, yes, halve, 1, stop [1]. The full sequence is 20, 10, 5, 6, 3, 4, 2, 1. (b) $\{3, 9, 15\}$ [1]. The multiples of 3 up to 20 are 3, 6, 9, 12, 15, 18; the odd ones are 3, 9 and 15. Set notation is not required for the mark — the three numbers, and only those three, are the set. (c) An explanation from the rule itself [1]: a rise happens only when the number is odd, because that is when the rule adds 1; adding 1 to an odd number makes it even; the next pass halves that even number, and halving an even number greater than 2 gives a smaller number — so a fall always follows a rise ($6 \rightarrow 3$ and $4 \rightarrow 2$). Accept any version of this chain of reasoning.

Solutions

Q1. (a) A profit is money made, so it is written positive: **+35**. Being below sea level is measured down from zero, so it is written with the minus sign: **-4**. (b) On a number line, numbers get smaller as you move left. From smallest to largest: **-6, -1, 0, 3, 7**. (c) From the origin, 5 steps left gives the first coordinate, **-5**, and 2 steps up gives the second coordinate, **+2**. So P is **(-5, 2)**. Its signs are **(-, +)**, which put it in the **top-left quadrant**.

Q2. (a) The factors of 23 are exactly 1 and 23 — exactly two factors, so **23 is prime**. And $39 = 3 \times 13$, so 39 has more than two factors: **39 is composite**, and one of its factors is **3** (or 13). (b) **25**, because $25 = 5 \times 5$ — a number times itself, which is what makes it a square number.

Q3. (a) Write all four fractions in twelfths: $\frac{2}{3} = \frac{8}{12}$, $\frac{1}{4} = \frac{3}{12}$, $\frac{5}{6} = \frac{10}{12}$, $\frac{1}{2} = \frac{6}{12}$. Now the top numbers decide: $3 < 6 < 8 < 10$, so the order is $\frac{1}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{6}$. (b) To rename quarters as twelfths, multiply the top and the bottom by 3: $\frac{3}{4} = \frac{9}{12}$, so $\square = 9$.

Q4. (a) Add with the decimal points lined up: 7 hundredths + 5 hundredths = 12 hundredths — write 2, rename 1 tenth; 3 tenths + 8 tenths + 1 tenth = 12 tenths — write 2, rename 1 one; 4 ones + 2 ones + 1 one = 7. The total length is **7.22 m**. (b) 4.37 rounds to 4, and 2.85 rounds to 3, so the estimate is $4 + 3 = 7$. The exact answer, 7.22, is close to 7, so it is **reasonable**.

Q5. (a) Rename $\frac{1}{2}$ as sixths: $\frac{1}{2} = \frac{3}{6}$. Then $\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$. For simplest form, divide the top and the bottom of $\frac{2}{6}$ by 2: the answer is $\frac{1}{3}$. (b) The lowest common denominator of 4 and 3 is 12. Rename: $2\frac{1}{4} = 2\frac{3}{12}$ and $\frac{2}{3} = \frac{8}{12}$. Add the fraction parts: $\frac{3}{12} + \frac{8}{12} = \frac{11}{12}$. So $2\frac{1}{4} + \frac{2}{3} = 2\frac{11}{12}$.

Q6. No calculator — place value does the work. (a) Split 30 as 3×10 . First $3.8 \times 3 = 11.4$; then $\times 10$ shifts every digit one place left, so **$3.8 \times 30 = 114$** . (b) Split 40 as 4×10 . First $8.4 \div 4 = 2.1$; then $\div 10$ shifts every digit one place right, with a 0 placeholder in the ones column, so **$8.4 \div 40 = 0.21$** .

Q7. (a) $\frac{1}{5}$ of 45 is $45 \div 5 = 9$, so $\frac{3}{5}$ of 45 is $3 \times 9 = 27$. (b) 10% of \$60 is $\$60 \div 10 = \6 . 5% is half of 10%, so 5% of \$60 is \$3. Then $15\% = 10\% + 5\% = \$6 + \$3 = \$9$. (c) $20\% = 2 \times 10\%$. 10% of \$45 is \$4.50, so the discount is $2 \times \$4.50 = \9 . The sale price is the full price minus the discount: $\$45 - \$9 = \$36$.

Q8. (a) \$9.90 is close to the friendly number \$10, and $4 \times \$10 = \40 , so the total cost is **about \$40**. (b) Round down: $4 \times \$9 = \36 . Round up: $4 \times \$10 = \40 . Rounding everything down gives less than the exact answer, and rounding everything up gives more, so the exact cost must be **between \$36 and \$40** — and \$39.60 is.

Q9. (a) *Formulate*: find the gap between the \$56 goal and the \$20 Zane already has, then share that gap over \$6 weeks. *Solve*: the gap is $\$56 - \$20 = \$36$, and $\$36 \div \$6 = 6$. (b) *Interpret and communicate*: **Zane will have saved enough after 6 weeks**. *Justify*: check by going back — 6 weeks $\times \$6 = \36 , and $\$36 + \$20 = \$56$ ✓, exactly the goal. The answer makes sense: it closes the gap exactly, with nothing left over.

Q10. (a) The pattern adds 4 each time, so term 5 uses $17 + 4 = 21$ matches. (b) Next-term rule: **start at 5 and add 4 each time**. (c) Check on term 3: $3 \times 4 + 1 = 13$, which matches the table ✓. Term 10: $10 \times 4 + 1 = 41$ matches — found in one step, with no need to list the terms in between.

Q11. (a) $72 \div 9 = 8$ first, so the sentence reads $8 + \square \times 4 = 28$. Undo the $+8$: $\square \times 4 = 20$. Undo the $\times 4$: $\square = 20 \div 4 = 5$. Check: $72 \div 9 + 5 \times 4 = 8 + 20 = 28$. ✓ $\square = 5$. (b) Undo the $\times 5$: $\square - 3 = 35 \div 5 = 7$. Undo the -3 : $\square = 7 + 3 = 10$. Check: $(10 - 3) \times 5 = 7 \times 5 = 35$. ✓ $\square = 10$. (c) Choose values for $\triangle$ in order and work out $\square = 14 - 4 \times \triangle$: $\triangle = 1$ gives $\square = 10$; $\triangle = 2$ gives $\square = 6$; $\triangle = 3$ gives $\square = 2$. If $\triangle = 4$, then $\square$ would be $14 - 16$, which is less than 0 — not a natural number — so the list is complete. The three pairs are **(1, 10), (2, 6) and (3, 2)**. Check one: $4 \times 2 + 6 = 8 + 6 = 14$. ✓

Q12. (a) 5 is odd, so add 1 $\rightarrow$ 6; 6 is even, so halve $\rightarrow$ 3; 3 is odd, so add 1 $\rightarrow$ 4; 4 is even, so halve $\rightarrow$ 2; 2 is even, so halve $\rightarrow$ 1, and the algorithm stops. The completed trace is:

Pass	Number	Even?	Step taken	New number
1	20	yes	halve	10
2	10	yes	halve	5
3	5	no	add 1	6
4	6	yes	halve	3
5	3	no	add 1	4
6	4	yes	halve	2
7	2	yes	halve	1

The sequence generated is 20, 10, 5, 6, 3, 4, 2, 1. (b) The multiples of 3 up to 20 are 3, 6, 9, 12, 15, 18. The odd numbers in that list are 3, 9 and 15, so the set is **{3, 9, 15}**. (c) A rise happens only when the number is odd, because that is when the rule adds 1. Adding 1 to an odd number makes it even, and the next pass halves that even number. Halving an even number greater than 2 always gives a smaller number — 6 halves to 3, and 4 halves to 2 — so every rise must be followed by a fall.

Answer key — for self-checking

Q1. (a) +35; -4 (b) -6, -1, 0, 3, 7 (c) (-5, 2), top-left quadrant. **Q2.** (a) 23 prime; 39 composite, factor 3 or 13 (b) 25. **Q3.** (a) $\frac{1}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{6}$ (b) 9. **Q4.** (a) 7.22 m (b) $4 + 3 = 7$; reasonable. **Q5.** (a) $\frac{1}{3}$ (b) $2\frac{11}{12}$. **Q6.** (a) 114 (b) 0.21. **Q7.** (a) 27 (b) \$9 (c) \$9; \$36. **Q8.** (a) about \$40 (b) \$36; \$40. **Q9.** (a) 6 weeks (b) check: $6 \times \$6 + \$20 = \$56$ ✓. **Q10.** (a) 21 (b) start at 5, add 4 each time (c) 41. **Q11.** (a) 5 (b) 10 (c) (1, 10), (2, 6), (3, 2). **Q12.** (a) 20, 10, 5, 6, 3, 4, 2, 1 (b) {3, 9, 15} (c) a rise makes an even number, and the next pass halves it.