nexamind EDUCATION

Name ____________________ Date ____________

Unit 1 · Integers — revision sheet

Everything you need from every section. Read it before the end-of-unit test.

1.1 Adding and subtracting integers

• Integers are the positive and negative whole numbers together with zero: … −3, −2, −1, 0, 1, 2, 3 …
• Adding a positive number moves you **right** on the number line; subtracting a positive number moves you **left**.
• Adding a negative is the same as subtracting: a + (−b) = a − b.
• Subtracting a negative is the same as adding: a − (−b) = a + b.
• The further left a number is on the number line, the smaller it is, so −7 < −3 < 0 < 2.

Key words: *integer · negative number · inverse · inverse operation · sum · difference*

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Integers: −200, −7, 0, 1, 43
Not integers: 0.5, −2¼, √10
−5 −4 −3 −2 −1 0 1 2 3 4 5
−9 < −2 < 0 < 6
−8 + 5 = −3 (start at −8, move 5 right)
6 + (−9) = 6 − 9 = −3
−7 − 4 = −11
```

1.2 Multiplying and dividing integers

• **positive × positive = positive** e.g. 6 × 7 = 42
• **positive × negative = negative** e.g. 9 × (−4) = −36
• **negative × negative = positive** e.g. (−8) × (−5) = 40
• The same three rules apply to division.
• In a chain of multiplications, count the negative factors: an **even** number of negatives gives a positive answer, an **odd** number gives a negative answer.
• Watch the brackets: $(-4)^2 = 16$ but $-4^2 = -16$.

Key words: *product · factor · quotient · index · inverse operation*

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5 × (−2) = (−2)+(−2)+(−2)+(−2)+(−2) = −10
(−8) × (−5) = 40
9 × (−4) = −36
−48 ÷ 6 = −8
−72 ÷ (−9) = 8
56 ÷ (−7) = −8
−3 × (−4) × (−2) = −24 (3 negatives → negative)
```

1.3 Lowest common multiples

• The **multiples** of a number are its times table: multiples of 4 are 4, 8, 12, 16, 20, …
• A **common multiple** of two numbers appears in both times tables.
• The **lowest common multiple (LCM)** is the smallest of those common multiples.
• Method: list the multiples of the **larger** number and stop at the first one that the smaller number divides into.
• If two numbers share no factors, LCM = a × b, e.g. LCM(5, 8) = 40.
• If one number is a multiple of the other, the LCM is the larger number, e.g. LCM(4, 12) = 12.

Key words: *multiple · common multiple · lowest common multiple (LCM) · digit*

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Multiples of 4: 4, 8, 12, 16, 20, 24, 28, …
Multiples of 6: 6, 12, 18, 24, 30, 36, …
Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36 …
Multiples of 6: 6, 12, 18, 24, 30, 36 …
Common multiples of 4 and 6: 12, 24, 36, …
LCM(4, 6) = 12
LCM(9, 12) = 36
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1.4 Highest common factors

• A **factor** divides exactly into a number: the factors of 12 are 1, 2, 3, 4, 6, 12.
• A **common factor** divides into both numbers.
• The **highest common factor (HCF)** is the biggest of them.
• Method: list the factors of the **smaller** number, then work downwards and stop at the first one that also divides the larger number.
• If one number is a factor of the other, the HCF is the smaller number, e.g. HCF(6, 18) = 6.
• Useful fact: HCF × LCM = a × b, e.g. for 8 and 12: 4 × 24 = 96 = 8 × 12.
• Dividing a fraction's numerator and denominator by their HCF simplifies it in one step.

Key words: *factor · common factor · highest common factor (HCF) · co-prime · simplify*

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Factors of 24: 1 × 24, 2 × 12, 3 × 8, 4 × 6 → 1, 2, 3, 4, 6, 8, 12, 24
Factors of 12: 1, 2, 3, 4, 6, 12
Factors of 18: 1, 2, 3, 6, 9, 18
Common factors: 1, 2, 3, 6
HCF(12, 18) = 6
HCF(24, 36) = 12
HCF(9, 20) = 1
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1.5 Tests for divisibility

- **÷ 2** — the last digit is even
- **÷ 3** — the sum of the digits is divisible by 3
- **÷ 4** — the number formed by the last two digits is divisible by 4
- **÷ 5** — the last digit is 0 or 5
- **÷ 6** — it passes the tests for both 2 and 3
- **÷ 8** — the number formed by the last three digits is divisible by 8
- **÷ 9** — the sum of the digits is divisible by 9
- **÷ 10** — the last digit is 0
- **÷ 11** — the difference between the sum of the odd-position digits and the sum of the even-position digits is 0 or a multiple of 11
- You can combine tests when the two divisors share no factors: a number divisible by 3 and by 4 is divisible by 12. But 2 and 4 *do* share a factor, so passing both does not guarantee divisibility by 8.

Key words: *divisible · tests of divisibility · remainder · digit sum · consecutive*

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15 ÷ 5 = 3, so 15 is divisible by 5
15 ÷ 4 = 3 remainder 3, so 15 is not divisible by 4
4 530 → last digit 0 → divisible by 2, 5 and 10
2 915 → last digit 5 → divisible by 5, not by 2 or 10
342 → 3 + 4 + 2 = 9 → divisible by 3 and by 9
8 514 → 8 + 5 + 1 + 4 = 18 → divisible by 3 and by 9
2 461 → 2 + 4 + 6 + 1 = 13 → divisible by neither
```

1.6 Square roots and cube roots

- Square numbers: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, …
- Cube numbers: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, …
- $\sqrt{}$ undoes squaring, and $\sqrt[3]{}$ undoes cubing — they are inverse operations.
- $\sqrt{144} = 12$ because $12^2 = 144$; $\sqrt[3]{125} = 5$ because $5^3 = 125$.
- To estimate $\sqrt{n}$ when n is not a square number, find the square numbers either side of it: $49 < 50 < 64$, so $7 < \sqrt{50} < 8$.
- 64 is special — it is both a square number (8^2) and a cube number (4^3).

Key words: *square number · square root · cube number · cube root · index · estimate*

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1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225
12² = 144
√81 = 9
√400 = 20
√121 = 11
1, 8, 27, 64, 125, 216, 343, 512, 729, 1000
4³ = 64
```