Year 9 Mathematics
Class Quiz 1
Topics 1, 2, 3, 4

PEN Education

2023

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Contents

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1 Introduction

Today we are going to spend an hour doing an in-class quiz! Everyone knows how much you *despise* such **tests**, but according to the <u>literature</u>, testing yourself is the most effective way to learn!

You should realise that over the past 4 weeks you have covered the following topics: 1 - Algebra techniques, 2 - Pythagoras' Theorem and Surds, 3 - Consumer Arithmetic and most recently: 4 - Factorisation.

The following quiz is deliberately CHUNKING these topics together to make it **easy** for you. You also must understand that in a school exam all of these questions will be mixed together! As such, your brain is going to have a difficult time changing gears between the different types of problems. So, we have planned half-yearly and yearly exams containing mixed questions for you. Yay!

2 Algebra

1. Evaluate $3x + 2y^2$ when: $\boxed{4}$

   (a) $x = 2$ and $y = 3$

   (c) $x = -23$ and $y = -3$

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   ....

   (b) $x = 5$ and $y = 2$

   (d) $x = \frac{1}{2}$ and $y = \frac{-3}{5}$

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2. Simply each of these expressions by collecting like terms. $\boxed{4}$

   (a) $3a + 2b - a + 4b$

   (c) $7m + 12n^2 + 2n^2 - 9m$

   ....

   ....

   (b) $5x^2y - 3xy + 7xy - x^2y$

   (d) $p^2 - 6p - p + 15$

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3. Simplify: $\boxed{4}$

   (a) $7ab \times 2a$

   (c) $\frac{20xy}{5x}$

   ....

   ....

   (b) $-3x \times -2y$

   (d) $25a \div 5 \times 3$

   ....

   ....

4. Write each expression as a single fraction. $\boxed{6}$

   (a) $\frac{a}{5} - \frac{2a}{3}$

   (d) $\frac{a}{2b} \times \frac{2ab}{7}$

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   ....

   (b) $\frac{3x}{8} - \frac{2x}{5}$

   (e) $\frac{3x}{4} \div \frac{6x}{7}$

   ....

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   (c) $\frac{a}{5} \times \frac{2a}{3}$

   (f) $\frac{ab}{3} \div \frac{6b}{b}$

   ....

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5. Expand: 6

    (a) $3(a+4)$ (e) $-3(3d-2)$

    ....

    (b) $6(x-1)$ (f) $-2(5\ell-4)$

    ....

    (c) $2(3b+2)$ (g) $-2x(3x+1)$

    ....

    (d) $5(4d-1)$ (h) $4x(2x+3)$

    ....

6. Expand and collect like terms for each of these expressions.   6

    (a) $3(a+2)+4(a+5)$

                                                ....

    ....   (e) $6(f-2)-3(2f-5)$

    (b) $4(2x-1)+3(3x+2)$

                                             ....

    ....(f) $2x(x+4)+3(x-2)$

    (c) $5(3d-2)+4(2d-7)$

                                             ....

    ....(g) $x(3x+2)-4x(2x-3)$

    (d) $8(4e+3)-5(e-1)$

                                             ....

7. Simplify: 4

    (a) $\frac{x+1}{4}+\frac{x+3}{3}$ (c) $\frac{2x+1}{3}-\frac{x+1}{4}$

    ....

    (b) $\frac{x-2}{2}+\frac{x-1}{3}$ (d) $\frac{3x-1}{4}-\frac{2x-1}{6}$

    ....

8. Expand and simplify: 16

(a) $(x+3)(x+5)$

....

....

(j) $(x+7)^2$

(b) $(x+7)(x-3)$

....

....

(k) $(2x-5)^2$

(c) $(x-3)(x+8)$

....

....

(l) $(3x-4)^2$

(d) $(2x+1)(3x-2)$

....

....

(m) $(x+2)^2 - (x-4)^2$

(e) $(4x+3)(3x+5)$

....

....

(n) $(2x+3)^2 - (2x-3)^2$

(f) $(5x-2)(2x+3)$

....

....

(o) $(x+1)(2x+3) + (2x-1)(3x+2)$

(g) $(x+5)(x-5)$

....

....

(p) $(x+2)(2x-5) - (3x+1)(2x-4)$

(h) $(2x+3)(2x-3)$

....

....

(i) $(3x-5)(3x+5)$

....

9. Fill in the missing gaps: 6

(a) $(x+3)(x+7) = x^2 + 10x + 21$

....

(b) $(x+2)(x-3) = x^2 - x - 6$

....

(c) $(x+6)(5+x) = x^2 + 11x + 30$

....

(d) $(x+4)(6+x) = x^2 + 10x + 24$

4

$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$

(e) $(2x - 1)(x + 3) = 2x^2 + 5x - 3$

$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$

(f) $(3x + 2)(2x + 7) = 6x^2 + 23x + 14$

$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$

3 Pythagoras' Theorem and Surds

1. For each of these right-angled triangles, find the value of the pronumeral, correct to 1 decimal place.

4

(a) [triangle with sides a, 12, 8]

(c) [triangle with sides 5, 14, c]

$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$

(b) [triangle with sides 11.7, b, 6.2]

(d) [triangle with sides 42, d, 18]

$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$
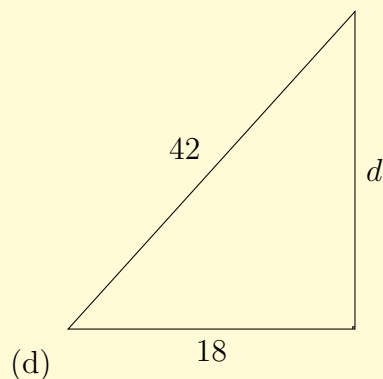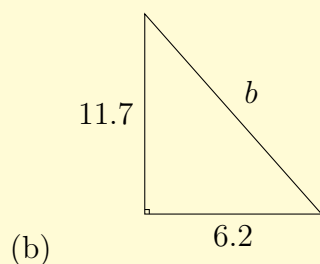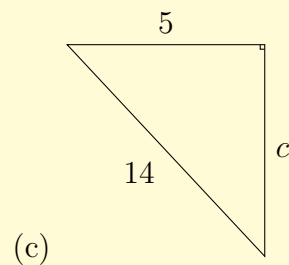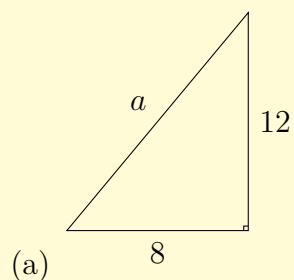
2. The lengths of the sides of a triangle are 8.2 cm, 11.6 cm and 14.3 cm. Is the triangle right-angled?

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3. In each part below, the two shorter side lengths of a right-angled triangle are given. State the length of the hypotenuse. $\boxed{6}$

    (a) 3 cm, 4 cm   (d) 0.3 cm, 0.4 cm

        ....

        ....

        ....

    (b) 5 cm, 12 cm   (e) 1 cm, 2.4 cm

        ....

        ....

        ....

    (c) 4 cm, 7.5 cm   (f) 12 cm, 22.5 cm

        ....

        ....

        ....

4. A gardener is designing a rectangular lawn $ABCD$. If $AB = 4.2$ m and $BC = 3.15$ m, how far apart should A and C be to ensure $\angle ABC = 90°$? $\boxed{2}$

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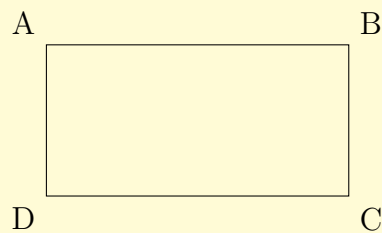
5. A plane takes off and after climbing on a straight line path for a distance of 1 km, it has flown a horizontal distance of 900 m. What is the plane's altitude, correct to the nearest metre? $\boxed{3}$

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6. Simplify each of these surds. $\boxed{6}$

(a) $\sqrt{20}$ (d) $4\sqrt{50}$

....

(b) $\sqrt{75}$ (e) $5\sqrt{108}$

....

(c) $2\sqrt{18}$ (f) $9\sqrt{27}$

....

7. Write each number as the square root of a whole number. $\boxed{4}$

(a) $2\sqrt{3}$ (c) $10\sqrt{5}$

....

(b) $3\sqrt{2}$ (d) $4\sqrt{7}$

....

8. Simplify: $\boxed{8}$

(a) $4\sqrt{2} + 7\sqrt{2}$ (e) $\sqrt{18} + \sqrt{32}$

....

(b) $8\sqrt{3} - 5\sqrt{3}$ (f) $\sqrt{27} - \sqrt{12}$

....

(c) $4\sqrt{2} \times 5\sqrt{3}$ (g) $4\sqrt{12} + 3\sqrt{75}$

....

(d) $3\sqrt{5} \times 4\sqrt{7}$ (h) $8\sqrt{50} - 2\sqrt{98}$

....

9. Expand and simplify: $\boxed{8}$

   (a) $\sqrt{2}(\sqrt{3}+\sqrt{10})$

   . . . .

   . . . .

   . . . .

   (b) $\sqrt{3}(4\sqrt{3}-5)$

   . . . .

   . . . .

   . . . .

   (c) $3\sqrt{5}(2\sqrt{2}-4\sqrt{5})$

   . . . .

   . . . .

   . . . .

   (d) $2\sqrt{2}(3\sqrt{3}+4\sqrt{2})$

   . . . .

   . . . .

   (e) $(2\sqrt{3}+1)(3\sqrt{3}-2)$

   . . . .

   . . . .

   . . . .

   (f) $(4\sqrt{2}+3)(5\sqrt{2}-7)$

   . . . .

   . . . .

   . . . .

   (g) $(3\sqrt{2}-1)^2$

   . . . .

   . . . .

   (h) $(\sqrt{5}+1)^2$

   . . . .

   . . . .

   (i) $(2\sqrt{5}+7\sqrt{2})(2\sqrt{5}-7\sqrt{2})$

   . . . .

   . . . .

   . . . .

10. Express each number with a rational denominator. $\boxed{4}$

(a)

$$\frac{3}{\sqrt{3}}$$

(c)

$$\frac{2}{4\sqrt{3}}$$

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....
....

(b)

$$\frac{2\sqrt{5}}{\sqrt{5}}$$

(d)

$$\frac{5\sqrt{3}}{3\sqrt{2}}$$

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....
....

11. Express each number with a rational denominator. $\boxed{4}$

(a)

$$\frac{3\sqrt{2}}{\sqrt{5}+2}$$

(c)

$$\frac{3\sqrt{2}+1}{\sqrt{5}+2}$$

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(b)

$$\frac{\sqrt{3}}{2\sqrt{3}-1}$$

(d)

$$\frac{\sqrt{2}+1}{\sqrt{3}+\sqrt{2}}$$

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12. For the rectangular prism to the right, calculate the length of each of these intervals. Give your answers as surds in simplest form. $\boxed{6}$

9

(a) *EG*   (d) *GM*

....

(b) *EC*   (e) *CM*

....

(c) *HC*   (f) *AM*

....

13. A vase is in the shape of a cylinder with base radius 4 cm and height 10 cm. What is the   2
    length, correct to 1 decimal place, of the longest flower stem that can just fit in the vase?

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4 Consumer Arithmetic
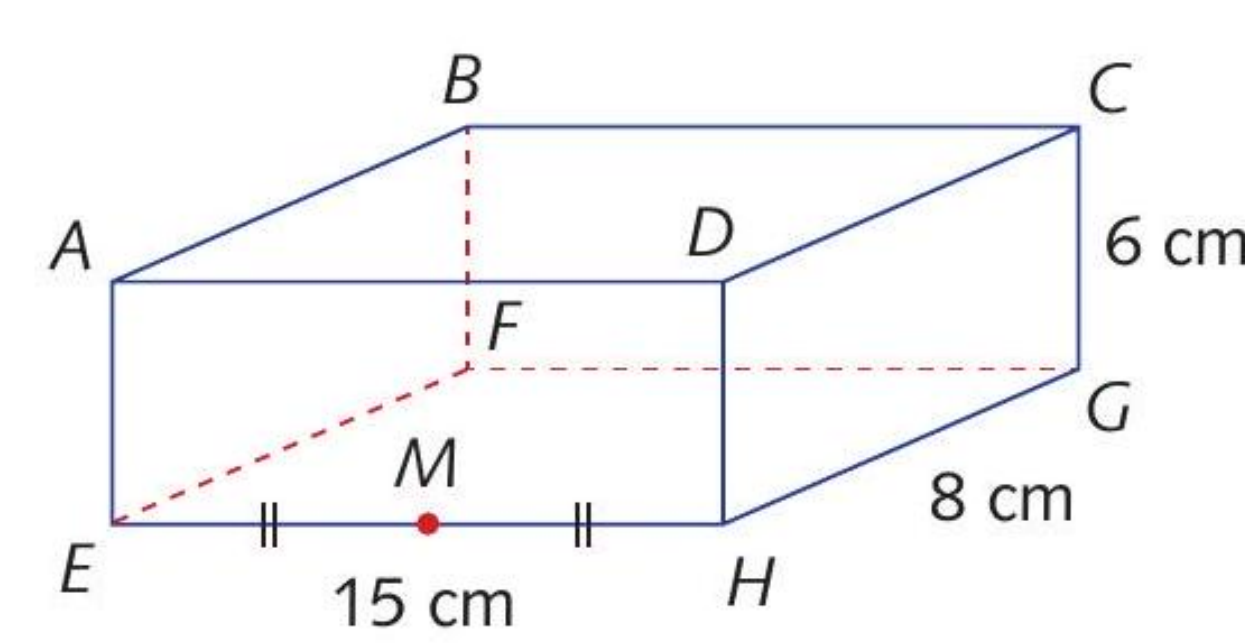
1. Express each percentage as a fraction in its simplest form.   6

(a) 18%

(d) 8.5%

....

(b) 64%

(e) $37\frac{1}{2}$%

....

(c) 2.6%

(f) $6\frac{2}{3}$%

....

2. Express each percentage as a decimal. $\boxed{6}$

(a) 8%

(d) 45.8%

....

(b) 27%

(e) $12\frac{1}{4}$%

....

(c) 9.6%

(f) $38\frac{1}{2}$%

....

3. Express each rational number as a percentage. $\boxed{6}$

(a) $\frac{2}{5}$

(d) 0.02

....

(b) $\frac{5}{8}$

(e) $\frac{4}{7}$

....

(c) 0.61

(f) $\frac{5}{9}$

....

4. Complete the following table. $\boxed{12}$

	Percentage	Fraction	Decimal
a	25%	$\frac{1}{4}$	0.25
b	30%	$\frac{3}{10}$	0.3
c	26%	$\frac{13}{50}$	0.26
d	66.67%	$\frac{2}{3}$	0.6667
e	8%	$\frac{2}{25}$	0.08
f	7.5%	$\frac{3}{40}$	0.075

5. Calculate:

   (a) 8% of 120

   ....

   (b) 16% of 54

   ....

   (c) 85% of $400

   ....

   (d) $9\frac{1}{2}$% of $6000

   ....

6. There are 650 students at a high school, 54% of whom are boys. How many boys are at the school?

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7. Netball is played by 6% of Australians. If the population of Australia is 22500000 , how many Australians play netball?

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8. In a class of 25 students, 8 travel to school by train. What percentage of the class travel to school by train?

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9. In a survey of 1200 adults, it was discovered that 114 of them were unemployed. What percentage of the adults surveyed were unemployed? | 2 |

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10. Find the new value if: | 4 |

   (a) 80 is increased by 40%   (c) 240 is decreased by 12%

   ....

   (b) 150 is increased by 6%   (d) 160 is decreased by 4%

   ....

11. During a sale, the price of a sofa bed is reduced by 20%. If the original price of the bed was $650, what is its sale price? | 2 |

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12. A salesperson is given a salary increase of 4%. If her existing weekly salary is $640, what will her new weekly salary be? | 2 |

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13. Joe's Electrical Store is having an 8% discount sale. The sale price of some items is given below. Calculate the price of the items before they were reduced. | 2 |

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   (a) Heater $276

   ....

   (b) Vacuum cleaner $138

....

   (c) Dishwasher $690

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   (d) Microwave $132.80

....

14. The enrolment of a school increased from 680 to 740 . Calculate the percentage increase, correct to 2 decimal places. $\boxed{2}$

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15. During a sale the price of a suit is reduced from $420 to $370. Calculate the percentage discount, correct to 1 decimal place. $\boxed{2}$

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16. What single percentage change, correct to 2 decimal places, is equivalent to each of these multiple changes? $\boxed{4}$

   (a) A 6% increase followed by a 12% increase

....

   (b) A 10% increase followed by a 10% decrease

....

   (c) A 16% decrease followed by a 8% decrease

....

   (d) A 12% decrease followed by a 14% increase

....

17. Over the course of a year an employee is given successive salary increases of 4%, 6% and 5%. $\boxed{2}$

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(a) If the employee's original monthly salary was $2600, what is the employee's salary after the three increases?

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(b) What single percentage change is equivalent to the three successive salary increases?

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18. To obtain a bonus, a salesperson's sales must increase by 20% in a two-month period. If the salesperson's sales increase by 8% in the first month, by what percentage must they increase in the second month to ensure the bonus is obtained? |2|

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19. Mia invests $6000 in the bank. How much will she have in her account after three years if the bank pays: |2|

(a) 8% simple interest p.a.

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(b) 4% compound interest p.a.

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20. The value of a new car depreciates at a compound rate of 6% each year. If the car has an initial value of $19960, calculate its value after: |3|

(a) one year

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(b) five years

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(c) 10 years

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....

5 Factorisation

1. Factorise: $\boxed{8}$

(a) $5a + 10$

(e) $6f^2 + 10f$

....

(b) $6c - 8$

(f) $-3h^2 - 15h$

....

(c) $9d - 24$

(g) $4a^2b + 6ab^2$

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(d) $3e^2 + 9e$

(h) $9mn^2 + 12mn$

....

2. Factorise: $\boxed{12}$

(a) $x^2 + 7x + 12$

(g) $x^2 - 6x - 55$

....

(b) $x^2 - 9x + 18$

(h) $3x^2 + 6x + 9$

....

(c) $x^2 - 5x - 6$

(i) $4x^2 - 8x + 12$

....

(d) $x^2 + 3x - 28$

(j) $x^2 - 100$

....

(e) $x^2 - 11x + 30$

(k) $9x^2 - 16y^2$

....

(f) $x^2 - 14x + 24$

(l) $1 - 16a^2$

....

3. Write each expression as a simplified single fraction. $\boxed{8}$

17

(a)
$$\frac{1}{(x-1)^2} \div \frac{1}{x^2-1}$$

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(b)
$$\frac{x-4}{x^2+2x+1} \times \frac{x+1}{x^2-16}$$

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(c)
$$\frac{m-2}{4m} \times \frac{m}{m-2}$$

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(d)
$$\frac{p+1}{8(p-1)} \times \frac{4(p-1)}{(p+1)(p+2)}$$

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(e)
$$\frac{4}{a} \div \frac{2}{a^2}$$

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(f)
$$\frac{5a-7}{2a+4} \times \frac{12}{10a-14}$$

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(g)
$$\frac{x^2+3x-4}{2x-2} \times \frac{6x-12}{x-1}$$

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(h)
$$\frac{x^3}{y^2} \div \frac{x}{2y^3}$$

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6   Homework

This week homework is a little different. The only thing that will be marked from you is a reattempt of every single question that you got incorrect on the class quiz. Tutors should have handed out an extra quiz for each student.

Question	Points	Score
1	8	
2	12	
3	8	
4	12	
5	4	
6	2	
7	2	
8	2	
9	2	
10	4	
11	2	
12	2	
13	2	
14	2	
15	2	
16	4	
17	2	
18	2	
19	2	
20	3	
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