Grade 8 Math Model Paper 4

ANSWER KEY

Full marks 50 · 2 hours

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

A practice paper by Science Playground, made to CDC's Specification Grid 2078, Mathematics, Grades 6–8; not an official CDC or exam board paper.

Question 1 — 3 marks

a. **Disjoint sets** are sets that have no element in common. **[1]**

Marking scheme

- Sets with no common element.

b. These are the elements outside both circles: $\{7, 8\}$. **[1]**

Marking scheme

- $\{7, 8\}$.

c. **No.** Stop 2 is on the red route and stop 5 on the green route, and to change buses she needs a stop on both. R and G are disjoint sets, so there is no such stop. **[1]**

Marking scheme

- No, with the reason (R and G have no common stop).

Question 2 — 4 marks

a. **The principal and the interest:** $A = P + I$. **[1]**

Marking scheme

- The principal and the interest added together.

b. **[1]**

$$I = \frac{80000 \times 1 \times 7}{100} = 5600$$

Rs 5,600.

Marking scheme

- Rs 5,600.

c. The interest in 3 years is $3 \times 5600 = 16800$, and the tax on it is $\frac{5}{100} \times 16800 = 840$. **[2]**

She receives $80000 + 16800 - 840 =$ **Rs 95,960**.

Marking scheme

- The interest Rs 16,800 and the tax Rs 840.
- Rs 95,960.

Question 3 — 5 marks

a. When the ratio of the first two equals the ratio of the last two: $a{:}b = c{:}d$. **[1]**

Marking scheme

- When $a{:}b = c{:}d$.

b. The load is $40 \times 30 = 1200$ kg. Smaller crates, more of them: **[2]**

$$\text{Crates} = \frac{1200}{24} = 50$$

50 crates.

Marking scheme

- The load, 1,200 kg (or $\frac{30}{24} \times 40$).

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- 50 crates.

c. Pokhara: $9600 - \frac{15}{100} \times 9600 = 9600 - 1440 = 8160$. **[2]**

Butwal: $10500 - \frac{25}{100} \times 10500 = 10500 - 2625 = 7875$, and with the sending $7875 + 400 = 8275$.

He should buy from the Pokhara shop: Rs 8,160 is Rs 115 less than Rs 8,275, even though Butwal's discount is bigger.

Marking scheme

- The two prices, Rs 8,160 and Rs 8,275 with the sending.
- The Pokhara shop, because its price is lower.

Question 4 — 5 marks

a. $38 \div 5 = 7$ remainder 3, $7 \div 5 = 1$ remainder 2, and $1 \div 5 = 0$ remainder 1. Reading the remainders upward: 123_5. **[1]**

Marking scheme

- 123_5.

b. **[2]**

$$3 \times 10^8 \times 5 \times 10^2 = 15 \times 10^{10} = 1.5 \times 10^{11}$$

1.5×10^{11} **m.**

Marking scheme

- 15×10^{10}, multiplying the numbers and adding the powers.
- 1.5×10^{11} m.

c. 109 parts are 218 cm, so 1 part is $218 \div 109 =$ **2 cm**. **[1]**

Marking scheme

- 2 cm.

d. **No.** A rational number's decimal ends or repeats the same block of digits. Here the zeros keep growing, so no block repeats, and the decimal never ends. It is irrational. **[1]**

Marking scheme

- No, with the reason (the decimal never ends and no block of digits repeats).

Question 5 — 5 marks

a. **[1]**

$$A = \frac{1}{2}h(a + b)$$

Marking scheme

- $A = \frac{1}{2}h(a + b)$.

b. **[1]**

$$A = \frac{1}{2} \times 16 \times (30 + 18) = 384$$

384 m².

Marking scheme

- 384 m².

c. Draw $CE \perp AB$. Then $CE = 16$ m and $EB = 30 - 18 = 12$ m, and by Pythagoras' theorem **[2]**

$$BC = \sqrt{12^2 + 16^2} = \sqrt{400} = 20$$

So $BC = 20$ m, and the distance round is $30 + 20 + 18 + 16 =$ **84 m**.

Marking scheme

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- $BC = 20$ m.
- 84 m.

d. **No.** 3 bags are enough for only 300 m², and the field is 384 m². She needs a fourth bag. **[1]**

Marking scheme

- No, with 300 m² compared with 384 m².

Question 6 — 3 marks

a. 1 **[1]**

Marking scheme

- 1.

b. The LCM of the denominators is $(x+1)(x-1)$. **[2]**

$$\begin{aligned}\frac{2}{x+1}+\frac{3}{x-1} &= \frac{2(x-1)+3(x+1)}{(x+1)(x-1)}\\ &= \frac{2x-2+3x+3}{x^2-1}\\ &= \frac{5x+1}{x^2-1}\end{aligned}$$

$$\frac{5x+1}{x^2-1}$$

Marking scheme

- One fraction over the LCM: $\frac{2(x-1)+3(x+1)}{(x+1)(x-1)}$.
- $\frac{5x+1}{x^2-1}$.

Question 7 — 3 marks

a. **Simultaneous equations:** two linear equations in two variables, to be solved together. **[1]**

Marking scheme

- Simultaneous equations.

b. For $x+2y=8$, that is $y=\frac{8-x}{2}$: **[2]**

x	0	2	8
y	4	3	0

For $x-y=2$, that is $y=x-2$:

x	0	2	6
y	-2	0	4

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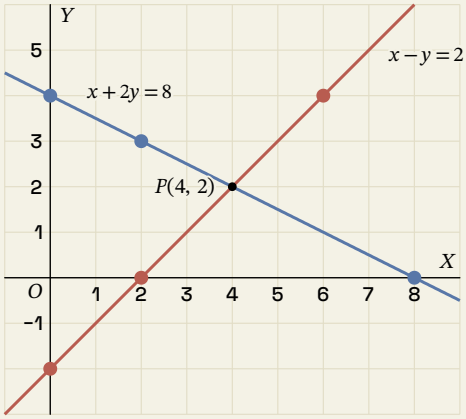


Figure 3 The two lines cross at $(4, 2)$.

The lines cross at $(4, 2)$. Check: $4 + 2 \times 2 = 8$ ✓ and $4 - 2 = 2$ ✓. $x = 4$, $y = 2$.

Marking scheme

- Both tables, and both lines drawn on the graph.
- $x = 4, y = 2$, read from where they cross.

Question 8

4 marks

a. **[2]**

$$9x^2 - 24x + 16 = (3x)^2 - 2 \times 3x \times 4 + 4^2$$
$$= (3x - 4)^2$$

$(3x - 4)^2$

Marking scheme

- Written as $(3x)^2 - 2 \times 3x \times 4 + 4^2$ (or the middle term split).
- $(3x - 4)^2$.

b. $4x^2 + 20x + 25 = (2x + 5)^2$, so the side of the square is $(2x + 5)$ m. **[2]**

When $x = 5$, the side is $2 \times 5 + 5 = 15$ m, and the distance round is $4 \times 15 = 60$ m. **No: the rope is 5 m short.**

Marking scheme

- The side $(2x + 5)$ m, from the factors.
- The distance round is 60 m when $x = 5$, so no.

Question 9

4 marks

a. **[1]**

$$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Marking scheme

- $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

b. 130° is less than 180°, so the bearing back is $130^\circ + 180^\circ =$ **310°**. **[2]**

The real distance is $3.5 \times 2 =$ **7 km**.

Marking scheme

- The bearing of P from Q is 310°.
- 7 km.

c. $\angle AGH$ and $\angle DHG$ are alternate angles. Between parallel lines they would be equal, but $75^\circ \neq 70^\circ$ **[1]**
. **No: the trails aren't parallel, so they will meet if they go on far enough.**

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Marking scheme

- No, with the reason (the alternate angles aren't equal).

Question 10 — 5 marks

a. Sketch $ABCD$ first, with the measures on it. Draw $AB = 6$ cm. At A, construct $60\circ$ with a compass, and cut 4.5 cm on that arm to get D. **[3]**

The opposite sides of a parallelogram are equal, so with center B and radius 4.5 cm, and center D and radius 6 cm, draw arcs that meet at C. Join BC and DC.

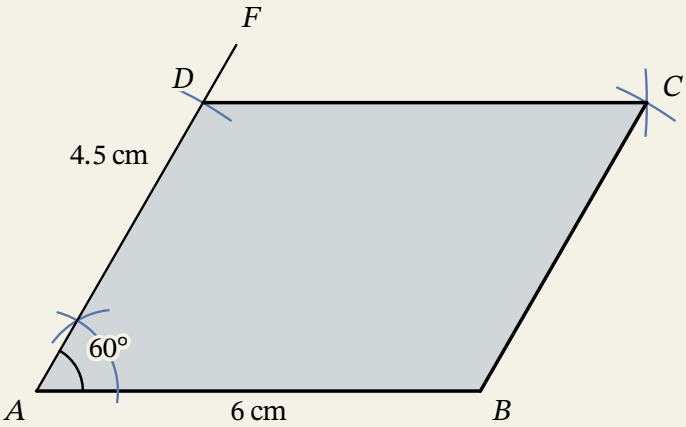


Figure 5 $ABCD$ with its arcs. See the steps in Construct it.

Marking scheme

- $AB = 6$ cm drawn, with a rough sketch.
- $60\circ$ at A with a compass, and $AD = 4.5$ cm cut on its arm.
- C found by arcs of 4.5 cm from B and 6 cm from D, and the parallelogram completed.

b. **[2]**

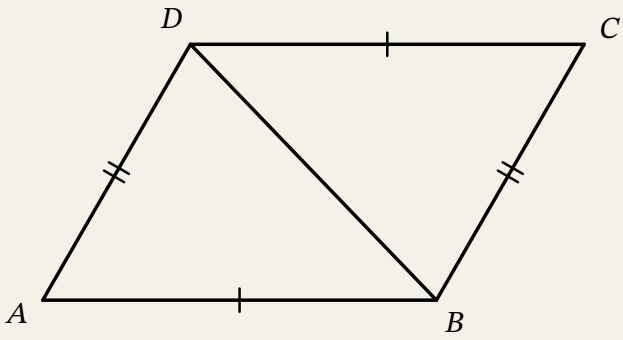


Figure 6 The diagonal BD cuts the parallelogram into two triangles.

	Statements	Reasons
1.	$AB = CD$ (S)	opposite sides of a parallelogram
2.	$AD = CB$ (S)	opposite sides of a parallelogram
3.	$BD = DB$ (S)	common side
4.	$\triangle ABD \cong \triangle CDB$	SSS

Proved. What it means: a diagonal cuts a parallelogram into two equal halves.

Marking scheme

- The three pairs of equal sides, with their reasons.
- $\triangle ABD \cong \triangle CDB$ by SSS, with the letters in matching order.

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Question 11 — 6 marks

a. **5 vertices:** the four corners of the base and the top. **[1]**

Marking scheme

- 5.

b. At each corner there are a square and two octagons: **4.8.8.** **[2]**

Each interior angle of a regular octagon is $\frac{(8-2)\times 180^\circ}{8} = 135^\circ$, so at a corner $90^\circ + 135^\circ + 135^\circ = 360^\circ$ ✓.

Marking scheme

- 4.8.8.
- $90^\circ + 135^\circ + 135^\circ = 360^\circ$.

c. Through 180°, $(x, y) \to (-x, -y)$. So $X(1, 1) \to X'(-1, -1), Y(5, 2) \to Y'(-5, -2)$ and $Z(2, 5) \to Z'(-2, -5)$. **[3]**

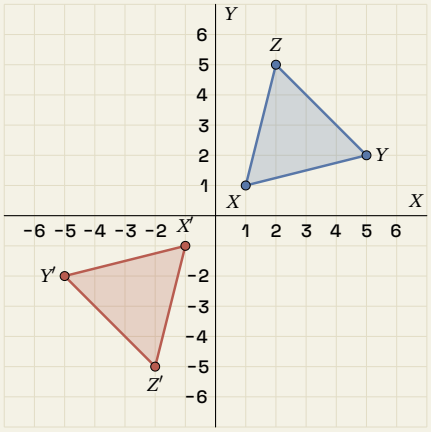


Figure 9 $\triangle XYZ$ and its image.

$X'(-1, -1)$, $Y'(-5, -2)$ **and** $Z'(-2, -5)$.

Marking scheme

- The rule used, $(x, y) \to (-x, -y)$, or the three vertices read correctly.
- $X'(-1, -1), Y'(-5, -2)$ and $Z'(-2, -5)$.
- The image drawn and named on the graph.

Question 12 — 3 marks

a. **[1]**

$$\frac{20}{100} \times 40000 = 8000$$

Rs 8,000.

Marking scheme

- Rs 8,000.

b. 100% stands for 360°, so every 1% stands for 3.6°. **[2]**

Spending	Share	Angle
Food	40%	$40 \times 3.6^\circ = 144^\circ$
Rent	25%	$25 \times 3.6^\circ = 90^\circ$
Education	20%	$20 \times 3.6^\circ = 72^\circ$
Other things	15%	$15 \times 3.6^\circ = 54^\circ$

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Check: $144^\circ + 90^\circ + 72^\circ + 54^\circ = 360^\circ$ ✓.

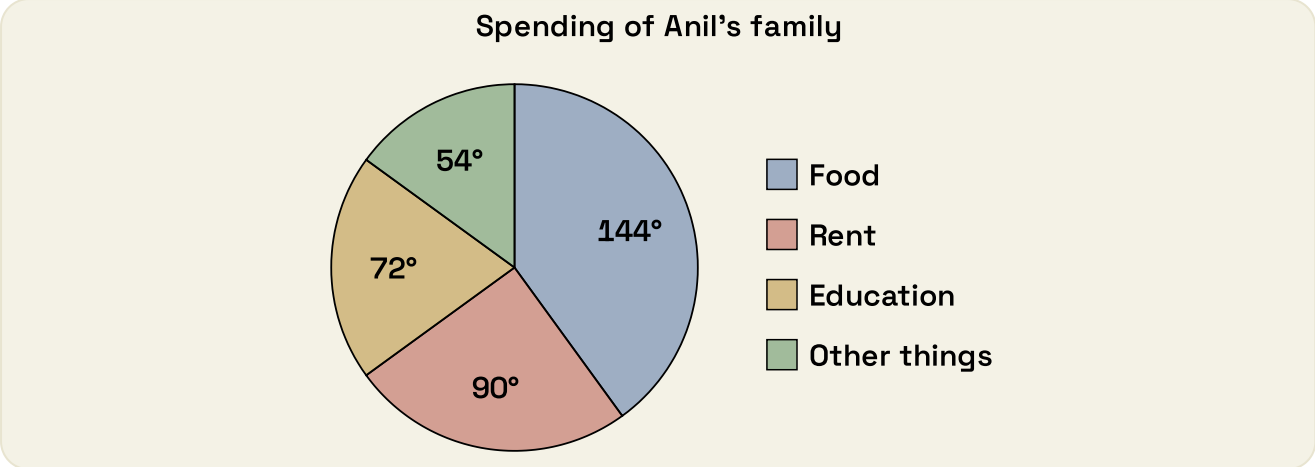


Figure 10 Drawn with a protractor, with a key and a title.

Marking scheme

- The four angles: 144∘, 90∘, 72∘ and 54∘.
- The pie chart drawn with those angles, with a key and a title.

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