Grade 8 Math Model Paper 1

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. **Overlapping sets** are two or more sets with at least one element in common and at least one element that isn't common. **[1]**

Marking scheme

- Sets with some elements in common and some not.

b. $M = \{3, 4, 8\}$. A proper subset has fewer elements than M, so $\{3\}$ **and** $\{4, 8\}$ will do. (Any two of $\{\}$, $\{3\}, \{4\}, \{8\}, \{3, 4\}, \{3, 8\}, \{4, 8\}$ are right.) **[1]**

Marking scheme

- Two subsets of M, each with fewer elements than M.

c. Then $S = \{3, 4\}$ and $M = \{3, 4, 8\}$. Every element of S is in M, and M has one more. **So S is a proper subset of M: $S \subset M$.** **[1]**

Marking scheme

- S is a proper subset of M, with the reason (every element of S is in M, and S has fewer elements).

Question 2 — 4 marks

a. **[1]**

$$\text{Profit percent} = \frac{\text{P}}{\text{CP}} \times 100\%$$

Marking scheme

- The formula $\frac{\text{P}}{\text{CP}} \times 100\%$.

b. **[1]**

$$\text{Discount} = \frac{15}{100} \times 14000 = 2100$$

Rs 2,100.

Marking scheme

- Rs 2,100.

c. Selling price $= 14000 - 2100 = 11900$. **[2]**

The profit is a percent of the cost price, so the selling price is 119% of it:

$$\text{CP} = \frac{11900 \times 100}{119} = 10000$$

The cost price was Rs 10,000. Check: 19% of Rs 10,000 is Rs 1,900, and $10000 + 1900 = 11900$ ✓.

Marking scheme

- Selling price Rs 11,900.
- Cost price Rs 10,000.

Question 3 — 5 marks

a. **[1]**

$$I = \frac{P \times T \times R}{100}$$

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Marking scheme

- The formula $I = \dfrac{PTR}{100}$.

b. 2 years 6 months $= 2\frac{1}{2}$ years $= 2.5$ years, and the rate is 12% a year. **[2]**

$$I = \frac{150000 \times 2.5 \times 12}{100} = 45000$$

Rs 45,000.

Marking scheme

- The time taken as 2.5 years and the values put in the formula.
- Rs 45,000.

c. The difference of the ratio is $5 - 3 = 2$ parts, so 2 parts are Rs 60,000 and 1 part is Rs 30,000. **[2]**

Kanchan has $5 \times 30000 =$ **Rs 1,50,000** and her sister $3 \times 30000 =$ **Rs 90,000**.

Together they have Rs 2,40,000, and the loan with its interest is $150000 + 45000 = 195000$. **Yes, they can, with Rs 45,000 left over.**

Marking scheme

- The savings: Rs 1,50,000 and Rs 90,000.
- Together Rs 2,40,000 against the Rs 1,95,000 owed, so yes.

Question 4 — 5 marks

a. The point moves 5 places to the left: 4.65×10^5 **kg**. **[1]**

Marking scheme

- 4.65×10^5 kg.

b. One packet weighs $\frac{12}{40} = 0.3$ kg, so 65 packets weigh $65 \times 0.3 =$ **19.5 kg**. **[1]**

Marking scheme

- 19.5 kg.

c. Let $x = 0.2727\ldots$ (i). Two digits repeat, so multiply by 100: $100x = 27.2727\ldots$ (ii). **[2]**

Subtracting (i) from (ii): $99x = 27$, so

$$x = \frac{27}{99} = \frac{3}{11}$$

$0.\overline{27} = \dfrac{3}{11}$.

Marking scheme

- $99x = 27$, from multiplying by 100 and subtracting.
- $x = \dfrac{3}{11}$ ($\dfrac{27}{99}$ also earns the mark).

d. **No.** The largest number five lamps can show is $11111_2 = 16 + 8 + 4 + 2 + 1 = 31$. And $37 = 100101_2$ has six digits, so it needs six lamps. **[1]**

Marking scheme

- No, with the reason ($37 = 100101_2$ needs six digits, or five lamps reach only 31).

Question 5 — 5 marks

a. $C = 2\pi r$ **[1]**

Marking scheme

- $C = 2\pi r$ (or $C = \pi d$).

b. **[1]**

$$C = \pi d = \frac{22}{7} \times 14 = 44$$

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44 m.

Marking scheme

- 44 m.

c. Park: $42 \times 28 = 1176$ m². Pond, of radius 7 m: $\frac{22}{7} \times 7 \times 7 = 154$ m². **[2]**

Area except the pond $= 1176 - 154 =$ **1,022 m²**.

Marking scheme

- The two areas, 1,176 m² and 154 m².
- 1,022 m².

d. **No.** With a diameter of 28 m the radius is 14 m, and the area is $\frac{22}{7} \times 14 \times 14 = 616$ m². That is **four times** 154 m², not twice: the radius is squared in πr^2. **[1]**

Marking scheme

- No, with the reason (616 m² is four times 154 m², or the radius is squared).

Question 6 — 3 marks

a. x^{mn} **[1]**

Marking scheme

- x^{mn}.

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

$$\begin{aligned}\frac{1}{x-2} - \frac{1}{x+2} &= \frac{(x+2)-(x-2)}{(x-2)(x+2)} \\ &= \frac{x+2-x+2}{x^2-4} \\ &= \frac{4}{x^2-4}\end{aligned}$$

$$\frac{4}{x^2-4}$$

Marking scheme

- One fraction over the LCM: $\frac{(x+2)-(x-2)}{(x-2)(x+2)}$.
- $\frac{4}{x^2-4}$.

Question 7 — 3 marks

a. **A straight line.** Each is a linear equation in two variables. **[1]**

Marking scheme

- A straight line.

b. For $x + y = 6$, that is $y = 6 - x$: **[2]**

x	0	2	6
y	6	4	0

For $2x - y = 3$, that is $y = 2x - 3$:

x	0	2	3
y	-3	1	3

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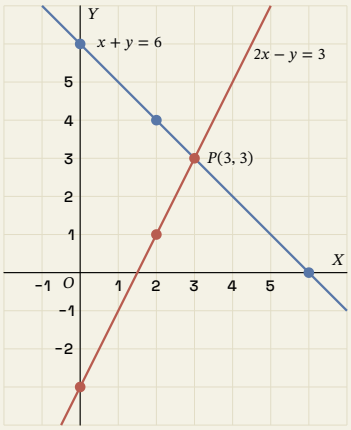


Figure 3 The two lines cross at $(3, 3)$.

The lines cross at $(3, 3)$. Check: $3 + 3 = 6$ ✓ and $2 \times 3 - 3 = 3$ ✓. $x = 3, y = 3$.

Marking scheme

- Both tables, and both lines drawn on the graph.
- $x = 3, y = 3$, read from where they cross.

Question 8

4 marks

a. **[2]**

$$x^2 + 2x - 15 = x^2 + 5x - 3x - 15 = (x + 5)(x - 3)$$
$$x^2 - 25 = (x + 5)(x - 5)$$

HCF $= x + 5$.

Marking scheme

- Both expressions factorized.
- HCF $= x + 5$.

b. Area = length × breadth and $x^2 + 2x - 15 = (x + 5)(x - 3)$, so the length is $(x + 5)$ m. **[2]**

$x + 5 = 9$, so $x = 4$. The breadth is $4 - 3 = 1$ m, and the area is $9 \times 1 =$ **9 m²**.

Check: $4^2 + 2 \times 4 - 15 = 16 + 8 - 15 = 9$ ✓.

Marking scheme

- The length is $(x + 5)$ m, so $x = 4$.
- The area is 9 m².

Question 9

4 marks

a. **5 faces, 6 vertices and 9 edges.** **[1]**

Marking scheme

- 5 faces, 6 vertices and 9 edges.

b. $ST \parallel QR$ and PQ is a transversal, so $\angle PST$ and $\angle PQR$ are corresponding angles, which are equal. **[2]**

$$3x - 10 = 2x + 15$$

$$x = 25$$

$x = 25$, and each angle is $65°$.

Marking scheme

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- $3x - 10 = 2x + 15$, with the reason (corresponding angles).
- $x = 25$.

c. **[1]**

$$AB = \sqrt{(5-1)^2 + (5-2)^2} = \sqrt{16+9} = 5$$

No. The peg and the tree are 5 m apart, so the rope is 0.5 m short.

Marking scheme

- No, with $AB = 5$ m as the reason.

Question 10 — 5 marks

a. Sketch $ABCD$ first, with the measures on it. Draw $AB = 6.5$ cm. With center A and radius 9 cm, and center B and radius 4.5 cm, draw arcs that meet at C. Join AC and BC. **[3]**

The opposite sides of a parallelogram are equal, so with center A and radius 4.5 cm, and center C and radius 6.5 cm, draw arcs that meet at D. Join AD and CD.

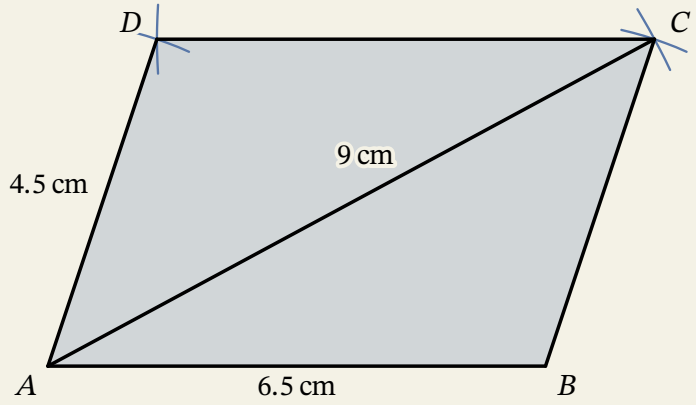


Figure 5 $ABCD$ with its arcs. See the steps in Construct it.

Marking scheme

- $AB = 6.5$ cm drawn, with a rough sketch.
- C found by arcs of 9 cm from A and 4.5 cm from B.
- D found by arcs of 4.5 cm from A and 6.5 cm from C, and the parallelogram completed.

b. **[2]**

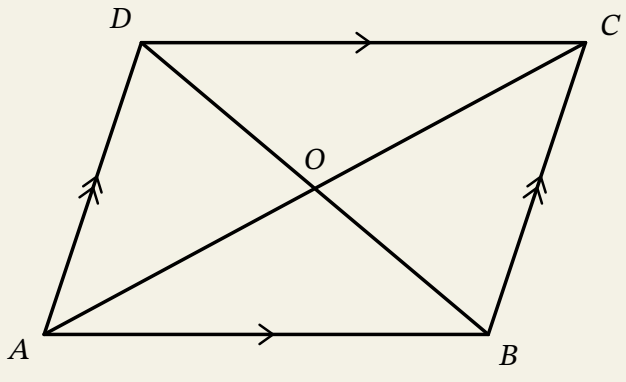


Figure 6 $AB \parallel DC$, and AC and BD are transversals.

	Statements	Reasons
1.	$\angle OAB = \angle OCD$ (A)	alternate angles, $AB \parallel DC$
2.	$AB = CD$ (S)	opposite sides of a parallelogram

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	Statements	Reasons
3.	$\angle OBA = \angle ODC$ (A)	alternate angles, $AB \parallel DC$
4.	$\triangle AOB \cong \triangle COD$	ASA

Proved. What it means: $OA = OC$ and $OB = OD$, so the diagonals of a parallelogram cut each other in half.

Marking scheme

- The three pairs (two angles and the side between them), with their reasons.
- $\triangle AOB \cong \triangle COD$ by ASA, with the letters in matching order.

Question 11

6 marks

a. **6.6.6.** Three hexagons meet at each corner. **[1]**

Marking scheme

- 6.6.6.

b. From B, the point C is 4 squares east and 4 squares south, so it lies due south-east: the bearing of C from B is **135°**. **[2]**

135° is less than 180°, so the bearing back is $135^\circ + 180^\circ =$ **315°**.

Marking scheme

- The bearing of C from B is 135°.
- The bearing of B from C is 315°.

c. In the X-axis, $(x, y) \to (x, -y)$. So $A(2, 1) \to A'(2, -1), B(2, 5) \to B'(2, -5)$ and $C(6, 1) \to C'(6, -1)$. **[3]**

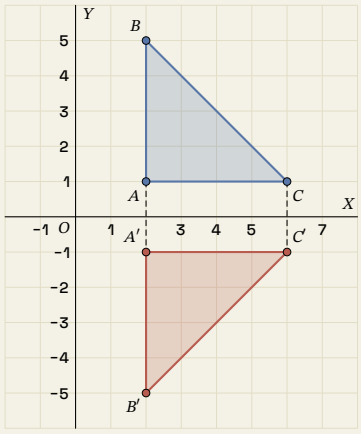


Figure 8 $\triangle ABC$ and its image.

$A'(2, -1)$**,** $B'(2, -5)$ **and** $C'(6, -1)$**.**

Marking scheme

- The rule used, $(x, y) \to (x, -y)$, or the three vertices read correctly.
- $A'(2, -1), B'(2, -5)$ and $C'(6, -1)$.
- The image drawn and named on the graph.

Question 12

3 marks

a. **[1]**

$$\overline{X} = \frac{1200 + 900 + 300 + 600}{4} = \frac{3000}{4} = 750$$

750 kg.

Marking scheme

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- 750 kg.

b. 3,000 kg stands for 360°, so every 100 kg stands for 12°. **[2]**

Crop	Harvest	Angle
Paddy	1,200 kg	$12 \times 12^\circ = 144^\circ$
Maize	900 kg	$9 \times 12^\circ = 108^\circ$
Millet	300 kg	$3 \times 12^\circ = 36^\circ$
Potato	600 kg	$6 \times 12^\circ = 72^\circ$

Check: $144^\circ + 108^\circ + 36^\circ + 72^\circ = 360^\circ$ ✓.

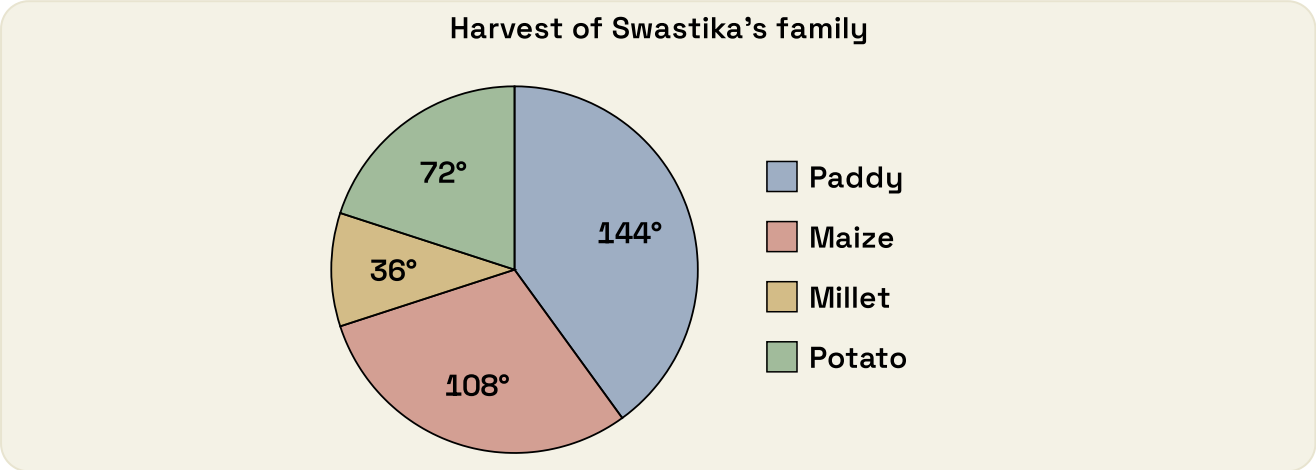


Figure 9 Drawn with a protractor, with a key and a title.

Marking scheme

- The four angles: 144°, 108°, 36° and 72°.
- The pie chart drawn with those angles, with a key and a title.

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