Grade 8 Math Model Paper 5

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. An **improper subset** of a set is the set itself: it has all the elements of the set. **[1]**

Marking scheme

- The set itself (a subset with all the elements of the set).

b. Each fruit is either in or out, so a set of 4 elements has $2 \times 2 \times 2 \times 2 = \mathbf{16}$ **subsets**. **[1]**

Marking scheme

- 16.

c. **No.** One of the 16 subsets is the empty set $\{\}$, a glass with no fruit in it. That leaves **15** different juices. **[1]**

Marking scheme

- No, with the reason (the empty set is a subset with no fruit, so there are 15).

Question 2 — 5 marks

a. One hive gives $96 \div 8 = 12$ kg, so 11 hives give $11 \times 12 = \mathbf{132\ kg}$. **[1]**

Marking scheme

- 132 kg.

b. Let $x = 0.4545\ldots$ (i). Two digits repeat, so multiply by 100: $100x = 45.4545\ldots$ (ii). **[2]**

Subtracting (i) from (ii): $99x = 45$, so

$$x = \frac{45}{99} = \frac{5}{11}$$

$0.\overline{45} = \dfrac{5}{11}$.

Marking scheme

- $99x = 45$, from multiplying by 100 and subtracting.
- $x = \dfrac{5}{11}$.

c. 9 months $= \frac{9}{12} = 0.75$ years. **[1]**

$$I = \frac{40000 \times 0.75 \times 12}{100} = 3600$$

Rs 3,600.

Marking scheme

- Rs 3,600.

d. **Yes.** Now the partner gets $\frac{2}{5} \times 90000 = 36000$. In the new ratio the partner would get $\frac{4}{9} \times 90000 = 40000$, which is Rs 4,000 more. **[1]**

Marking scheme

- Yes, with the two shares (Rs 36,000 and Rs 40,000) compared.

Question 3 — 4 marks

a. **0, 1, 2, 3 and 4.** **[1]**

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Marking scheme

- 0, 1, 2, 3 and 4.

b. [1]

$$324_5 = 3 \times 5^2 + 2 \times 5^1 + 4 \times 5^0 = 75 + 10 + 4 = 89$$

89.

Marking scheme

- 89.

c. Divide 89 by 2 again and again, keeping the remainders: [2]

Division	Quotient	Remainder
$89 \div 2$	44	1
$44 \div 2$	22	0
$22 \div 2$	11	0
$11 \div 2$	5	1
$5 \div 2$	2	1
$2 \div 2$	1	0
$1 \div 2$	0	1

Reading the remainders from the bottom up: 1011001_2. Check: $64 + 16 + 8 + 1 = 89$ ✓.

Marking scheme

- The repeated division by 2, with the remainders.
- 1011001_2.

Question 4

5 marks

a. **SP = MP − D** [1]

Marking scheme

- SP = MP − D.

b. Discount $= 32000 - 27200 = 4800$, so [2]

$$\text{Discount percent} = \frac{4800}{32000} \times 100\% = 15\%$$

15%.

Marking scheme

- The discount, Rs 4,800.
- 15%, taken on the marked price.

c. One discount of 20%: $20000 - \frac{20}{100} \times 20000 = 16000$. [2]

Two discounts: $20000 - 2000 = 18000$, then $18000 - \frac{10}{100} \times 18000 = 18000 - 1800 = 16200$.

No, he isn't right. The second 10% is taken on a smaller price. **She should choose the one discount of 20%,** which saves her Rs 200 more.

Marking scheme

- The two prices, Rs 16,000 and Rs 16,200.
- Not the same: she should choose the one discount of 20%.

Question 5

5 marks

a. [1]

$$A = \frac{1}{2} d_1 d_2$$

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Marking scheme

- $A = \frac{1}{2} d_1 d_2$.

b. **[1]**

$$A = \frac{1}{2} \times 16 \times 12 = 96$$

96 m².

Marking scheme

- 96 m².

c. The diagonals of a rhombus cut each other in half at right angles, so $AO = 8$ m and $BO = 6$ m, and by Pythagoras' theorem **[2]**

$$AB = \sqrt{8^2 + 6^2} = \sqrt{100} = 10$$

All four sides are equal, so the fencing is $4 \times 10 =$ **40 m**.

Marking scheme

- The side $AB = 10$ m.
- 40 m.

d. **No.** The square has sides of 10 m and an area of $10 \times 10 = 100$ m², which is 4 m² more than the rhombus. Equal sides don't mean equal areas. **[1]**

Marking scheme

- No, with 100 m² compared with 96 m².

Question 6

3 marks

a. We **multiply the first fraction by the reciprocal of the second**: turn the second fraction upside down and multiply. **[1]**

Marking scheme

- Multiply by the reciprocal of the second fraction.

b. **[2]**

$$\left(\frac{2x^2}{y}\right)^3 \times \frac{y^4}{4x^5} = \frac{8x^6}{y^3} \times \frac{y^4}{4x^5} = 2x^{6-5}y^{4-3} = 2xy$$

$2xy$

Marking scheme

- $\left(\frac{2x^2}{y}\right)^3 = \frac{8x^6}{y^3}$.
- $2xy$.

Question 7

3 marks

a. **Two points.** (A third point is a good check.) **[1]**

Marking scheme

- Two.

b. For $y = 2x - 1$: **[2]**

x	0	1	3
y	-1	1	5

For $x + y = 5$, that is $y = 5 - x$:

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x	0	2	5
y	5	3	0

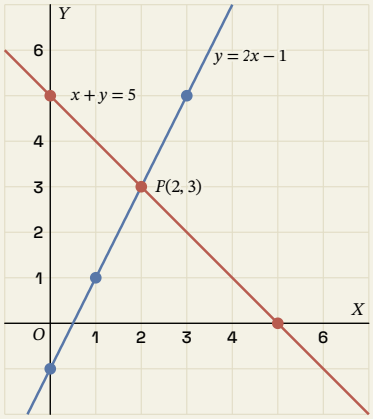


Figure 2 The two roads cross at $(2, 3)$.

Check: $2 \times 2 - 1 = 3$ ✓ and $2 + 3 = 5$ ✓. **The roads cross at $(2, 3)$.**

Marking scheme

- Both tables, and both lines drawn on the graph.
- The crossing $(2, 3)$, read from the graph.

Question 8

4 marks

a. **[2]**

$$2x^2 - 8x = 2x(x - 4)$$
$$x^2 - x - 12 = x^2 - 4x + 3x - 12 = (x - 4)(x + 3)$$

HCF $= x - 4$.

Marking scheme

- Both expressions factorized.
- HCF $= x - 4$.

b. Let each row have x chairs, so there are $x - 4$ rows. Then $x(x - 4) = 96$, so $x^2 - 4x - 96 = 0$, and **[2]**

$$(x - 12)(x + 8) = 0$$

So $x = 12$ or $x = -8$. A number of chairs can't be negative, so $x = 12$: 8 rows of 12.

One more row makes $96 + 12 = 108$ chairs. **Yes: 108 chairs are enough for 100 guests.**

Marking scheme

- The equation $x^2 - 4x - 96 = 0$, factorized.
- 12 chairs in a row, so 108 chairs with one more row: yes.

Question 9

4 marks

a. **360∘.** **[1]**

Marking scheme

- 360∘.

b. $\angle BGH$ and $\angle DHG$ are co-interior angles, which add up to 180∘ between parallel lines. **[2]**

$$3x + 20 + 2x + 10 = 180$$

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$$5x = 150$$

$x = 30$, so the angles are 110° and 70°.

Marking scheme

- $(3x + 20) + (2x + 10) = 180$, with the reason (co-interior angles).
- $x = 30$.

c. **No.** All four triangles meet at one point, but only three faces meet at a vertex of a tetrahedron. When it is folded, the fourth triangle lands on the first, and the base stays open. **[1]**

Marking scheme

- No, with the reason (only three faces meet at a vertex, so the fourth lands on the first).

Question 10 — 5 marks

a. Sketch the rectangle first. Draw $AB = 7$ cm. At A, construct 90° with a compass, and cut 4.5 cm on that arm to get D. At B, construct 90° in the same way and cut 4.5 cm to get C. Join C and D. **[3]**

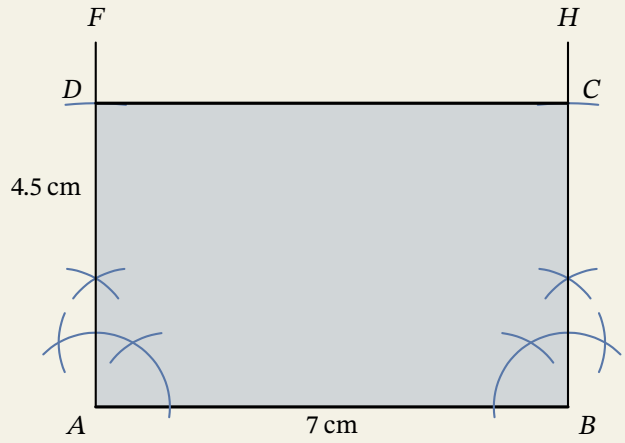


Figure 5 $ABCD$ with its arcs. See the steps in Construct it.

Marking scheme

- $AB = 7$ cm drawn, with a rough sketch.
- The right angles at A and B drawn with a compass.
- AD and BC cut at 4.5 cm, and the rectangle completed.

b. **[2]**

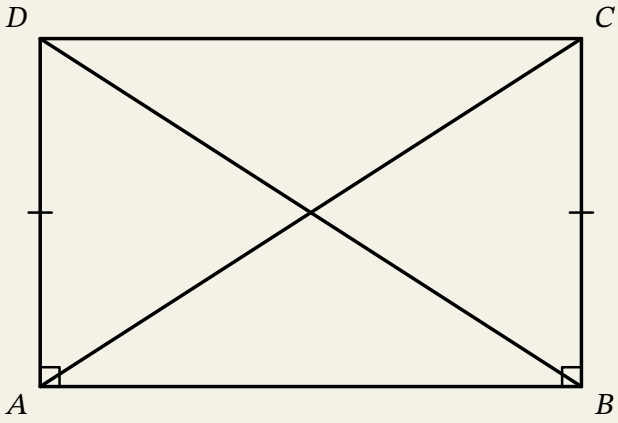


Figure 6 The triangles ABC and BAD share the side AB.

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	Statements	Reasons
1.	$BC = AD$ (S)	opposite sides of a rectangle
2.	$\angle ABC = \angle BAD$ (A)	both are right angles
3.	$AB = BA$ (S)	common side
4.	$\triangle ABC \cong \triangle BAD$	SAS

Proved. So $AC = BD$: the diagonals of a rectangle are equal, and a frame whose diagonals differ isn't a true rectangle.

Marking scheme

- The three pairs (two sides and the angle between them), with their reasons.
- $\triangle ABC \cong \triangle BAD$ by SAS, so $AC = BD$.

Question 11 — 6 marks

a. $L(2, 1)$ and $N(2, 5)$ are straight above each other, so $LN = 5 - 1 =$ **4 units** (4 m). **[1]**

Marking scheme

- 4 units.

b. From L, the point M is 4 squares east and 4 squares north, so it lies due north-east: the bearing of M from L is **045°**. **[2]**

45° is less than 180°, so the bearing back is $045^\circ + 180^\circ =$ **225°**.

Marking scheme

- The bearing of M from L is 045°.
- The bearing of L from M is 225°.

c. In the Y-axis, $(x, y) \to (-x, y)$. So $L(2, 1) \to L'(-2, 1)$, $M(6, 5) \to M'(-6, 5)$ and $N(2, 5) \to N'(-2, 5)$. **[3]**

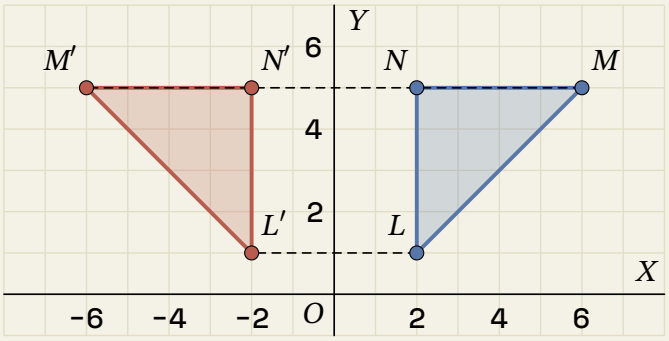


Figure 8 $\triangle LMN$ and its image.

$L'(-2, 1)$, $M'(-6, 5)$ **and** $N'(-2, 5)$.

Marking scheme

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

Question 12 — 3 marks

a. $\overline{X} = \dfrac{\Sigma X}{N}$, so $\Sigma X = 14 \times 6 =$ **84 liters**. **[1]**

Marking scheme

- 84 liters.

b. $12 + 15 + x + 18 + 11 + 16 = 84$, so $72 + x = 84$ and $x = 12$. **[2]**

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The data are 12, 15, 12, 18, 11 and 16. 12 comes twice and every other number once, so **the mode is 12 liters**.

Marking scheme

- $x = 12$.
- The mode is 12 liters.

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