Grade 8 Math Model Paper 7

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. A **proper subset** of a set is a subset that has fewer elements than the set: at least one element of the set isn't in it. **[1]**

Marking scheme

- A subset with fewer elements than the set.

b. These are in the overlap of the circles: $\{12, 24\}$. **[1]**

Marking scheme

- $\{12, 24\}$.

c. **Yes.** The days in common are 12 and 24, and only day 12 falls while she is away. She can go on **day 24**. **[1]**

Marking scheme

- Yes, on day 24, because it is in the overlap and she is back by then.

Question 2 — 4 marks

a. The **marked price** is the price written on the article, before any discount. **[1]**

Marking scheme

- The price written on the article, before any discount.

b. **[1]**

$$\frac{10}{100} \times 6000 = 600$$

Rs 600.

Marking scheme

- Rs 600.

c. The selling price must be $2700 + \frac{20}{100} \times 2700 = 3240$. **[2]**

After a discount of 10%, the selling price is 90% of the marked price, so

$$\text{MP} = \frac{3240 \times 100}{90} = 3600$$

He should mark it at Rs 3,600. Check: 10% of Rs 3,600 is Rs 360, and $3600 - 360 = 3240$ ✓.

Marking scheme

- The selling price, Rs 3,240.
- The marked price, Rs 3,600.

Question 3 — 5 marks

a. **[1]**

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

Marking scheme

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

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b. [2]

$$P = \frac{9000 \times 100}{3 \times 10} = 30000$$

Rs 30,000. Check: $\frac{30000 \times 3 \times 10}{100} = 9000$ ✓.

Marking scheme

- The values put in the formula for P.
- Rs 30,000.

c. More workers, fewer days: 18 workers take $\frac{12}{18} \times 15 = 10$ days. [2]

12 workers cost $12 \times 15 \times 900 = 162000$. 18 workers cost $18 \times 10 \times 850 = 153000$.

He should hire the 18 workers: they cost Rs 9,000 less.

Marking scheme

- 10 days for the 18 workers.
- The costs Rs 1,62,000 and Rs 1,53,000, so the 18 workers.

Question 4 — 5 marks

a. $67 \div 5 = 13$ remainder 2, $13 \div 5 = 2$ remainder 3, and $2 \div 5 = 0$ remainder 2. Reading the remainders upward: 232_5. [1]

Marking scheme

- 232_5.

b. $5 = 2^2 + 1^2$, so $\sqrt{5}$ is the slanting side of a right-angled triangle with sides 2 and 1. [2]

On the number line, mark 2 from O. At 2, draw a line 1 unit long at right angles, and join its top to O. With center O and that slanting side as the radius, draw an arc down to the number line. It cuts the line at $\sqrt{5}$.

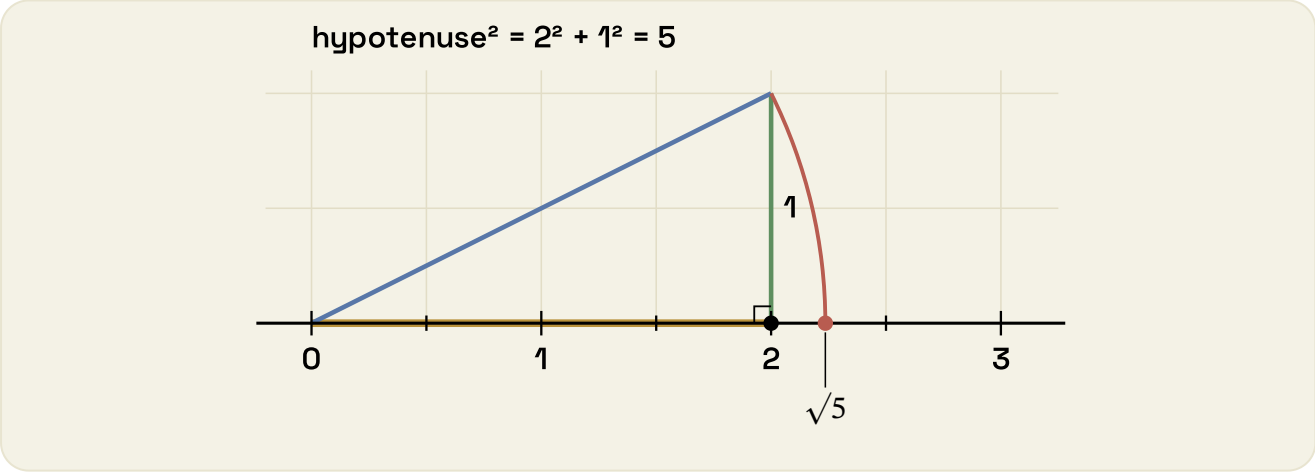


Figure 2 $\sqrt{5}$ on the number line.

Marking scheme

- The right-angled triangle with sides 2 and 1 on the number line.
- The arc from O, marking $\sqrt{5}$ on the line.

c. $6 \times 50000 = 300000$ cm $= 3000$ m $=$ **3 km.** [1]

Marking scheme

- 3 km.

d. **No.** $2.24 \times 2.24 = 5.0176$, not 5. The side is $\sqrt{5}$ m, an irrational number, so no decimal that ends is exact. 2.24 is only close to it. [1]

Marking scheme

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- No, with the reason ($2.24^2 \neq 5$, or $\sqrt{5}$ is irrational).

Question 5 — 5 marks

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

Marking scheme

- $A = \pi r^2$.

b. **[1]**

$$2\pi r = 88, \qquad r = \frac{88 \times 7}{2 \times 22} = 14$$

14 m.

Marking scheme

- 14 m.

c. The outer circle has a radius of $14 + 7 = 21$ m. **[2]**

$$\text{Path} = \frac{22}{7} \times 21 \times 21 - \frac{22}{7} \times 14 \times 14 = 1386 - 616 = 770$$

770 m².

Marking scheme

- The two areas, 1,386 m² and 616 m².
- 770 m².

d. **No.** The outer circle has a radius of 21 m, so its fence is $2 \times \frac{22}{7} \times 21 = 132$ m. That is $132 - 88 = 44$ m more wire, not 14 m. **[1]**

Marking scheme

- No, with the outer fence of 132 m, which is 44 m more.

Question 6 — 3 marks

a. x^{m+n} **[1]**

Marking scheme

- x^{m+n}.

b. **[2]**

$$52^2 - 48^2 = (52 + 48)(52 - 48) = 100 \times 4 = 400$$

400

Marking scheme

- Factorized: $(52 + 48)(52 - 48)$.
- 400.

Question 7 — 3 marks

a. **2**, because the highest power of x is 2. **[1]**

Marking scheme

- 2.

b. Two numbers that multiply to -20 and add up to 1 are 5 and -4. **[2]**

$$\begin{aligned} x^2 + 5x - 4x - 20 &= 0 \\ x(x + 5) - 4(x + 5) &= 0 \\ (x + 5)(x - 4) &= 0 \end{aligned}$$

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So $x = -5$ **or** $x = 4$. Check: $25 - 5 - 20 = 0$ ✓ and $16 + 4 - 20 = 0$ ✓.

Marking scheme

- Factorized: $(x + 5)(x - 4) = 0$.
- $x = -5$ or $x = 4$.

Question 8 — 4 marks

a. $x^2 - 9 = (x + 3)(x - 3)$, which is the LCM of the denominators. **[2]**

$$\begin{aligned}\frac{3}{x-3} - \frac{18}{(x+3)(x-3)} &= \frac{3(x+3) - 18}{(x+3)(x-3)} \\ &= \frac{3x - 9}{(x+3)(x-3)} \\ &= \frac{3(x-3)}{(x+3)(x-3)} = \frac{3}{x+3}\end{aligned}$$

$$\frac{3}{x+3}$$

Marking scheme

- One fraction over the LCM: $\dfrac{3(x+3) - 18}{(x+3)(x-3)}$.
- $\dfrac{3}{x+3}$.

b. The times are $\dfrac{120}{x}$ and $\dfrac{120}{x+20}$ hours. **[2]**

$$\frac{120}{x} - \frac{120}{x+20} = \frac{120(x+20) - 120x}{x(x+20)} = \frac{2400}{x(x+20)}$$

When $x = 40$, this is $\dfrac{2400}{40 \times 60} = 1$ hour. **Yes: it saves 60 minutes, which is more than 45.**

Marking scheme

- The fraction $\dfrac{2400}{x(x+20)}$.
- 1 hour when $x = 40$, so yes.

Question 9 — 4 marks

a. **[1]**

$$OP = \sqrt{x^2 + y^2}$$

Marking scheme

- $OP = \sqrt{x^2 + y^2}$.

b. At each corner there are three triangles and then two squares: **3.3.3.4.4**. **[2]**

At a corner, $60^\circ + 60^\circ + 60^\circ + 90^\circ + 90^\circ = 360^\circ$ ✓.

Marking scheme

- 3.3.3.4.4.
- $60^\circ + 60^\circ + 60^\circ + 90^\circ + 90^\circ = 360^\circ$.

c. **No.** The 44 cm edge of the rectangle must go exactly round a circle, but a circle of radius 6 cm has a circumference of $2 \times \dfrac{22}{7} \times 6 \approx 37.7$ cm. She needs circles of radius 7 cm, whose circumference is 44 cm. **[1]**

Marking scheme

- No, with the reason (the circumference is about 37.7 cm, not 44 cm).

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Question 10 — 5 marks

a. Sketch $ABCD$ first, with the measures on it. A rhombus is a parallelogram with all its sides equal. Draw $AB = 5$ cm. At A, construct $75°$ with a compass, and cut 5 cm on that arm to get D. **[3]**

With center B and radius 5 cm, and center D and radius 5 cm, draw arcs that meet at C. Join BC and DC.

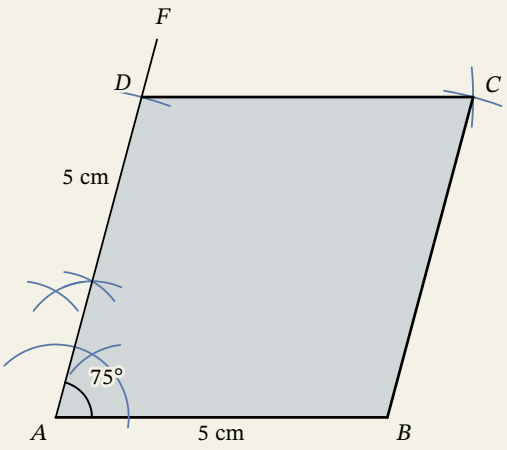


Figure 5 $ABCD$ with its arcs. See the steps in Construct it.

Marking scheme

- $AB = 5$ cm drawn, with a rough sketch.
- $75°$ at A with a compass, and $AD = 5$ cm cut on its arm.
- C found by arcs of 5 cm from B and D, and the rhombus completed.

b. **[2]**

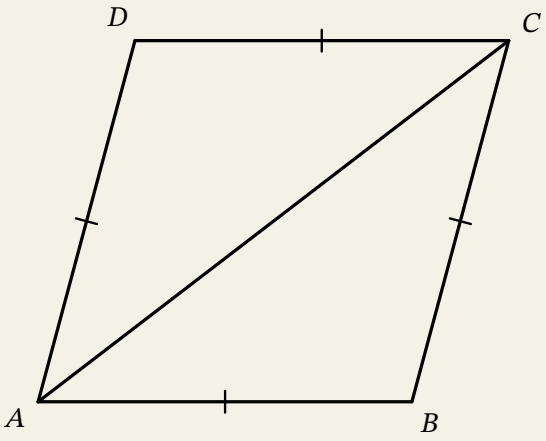


Figure 6 The diagonal AC of the rhombus.

	Statements	Reasons
1.	$AB = AD$ (S)	sides of a rhombus
2.	$BC = DC$ (S)	sides of a rhombus
3.	$AC = AC$ (S)	common side
4.	$\triangle ABC \cong \triangle ADC$	SSS

Proved. So $\angle BAC = \angle DAC$: the diagonal AC cuts $\angle DAB$ in half.

Marking scheme

- The three pairs of equal sides, with their reasons.
- $\triangle ABC \cong \triangle ADC$ by SSS, so $\angle BAC = \angle DAC$.

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Question 11 — 6 marks

a. **They are equal.** **[1]**

Marking scheme

- They are equal.

b. Real length $= 8 \times 5 =$ **40 m.** **[2]**

Length on the plan $= 65 \div 5 =$ **13 cm.**

Marking scheme

- 40 m.
- 13 cm.

c. The rule is $(x, y) \to (x + 6, y - 3)$. So $A(-5, 1) \to A'(1, -2), B(-2, 1) \to B'(4, -2), C(-1, 3) \to C'(5, 0)$ and $D(-4, 3) \to D'(2, 0)$. **[3]**

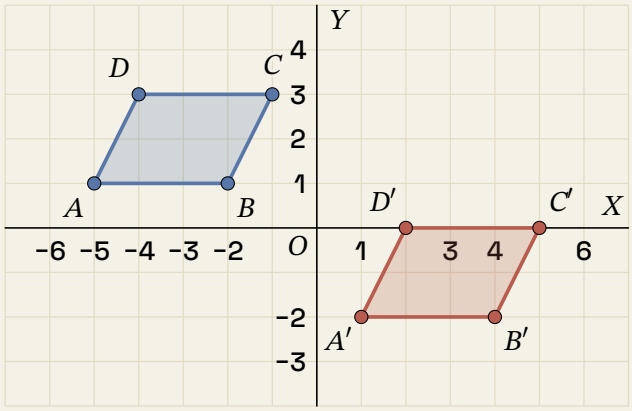


Figure 8 $ABCD$ and its image.

$A'(1, -2)$, $B'(4, -2)$, $C'(5, 0)$ **and** $D'(2, 0)$.

Marking scheme

- The rule used, $(x, y) \to (x + 6, y - 3)$, or the vertices read correctly.
- $A'(1, -2), B'(4, -2), C'(5, 0)$ and $D'(2, 0)$.
- The image drawn and named on the graph.

Question 12 — 3 marks

a. The day has 24 hours, so one hour stands for $360^\circ \div 24 =$ **15°.** **[1]**

Marking scheme

- 15°.

b. **[2]**

Activity	Hours	Angle
Sleep	9	$9 \times 15^\circ = 135^\circ$
School	7	$7 \times 15^\circ = 105^\circ$
Study	3	$3 \times 15^\circ = 45^\circ$
Play	2	$2 \times 15^\circ = 30^\circ$
Other things	3	$3 \times 15^\circ = 45^\circ$

Check: $135^\circ + 105^\circ + 45^\circ + 30^\circ + 45^\circ = 360^\circ$ ✓.

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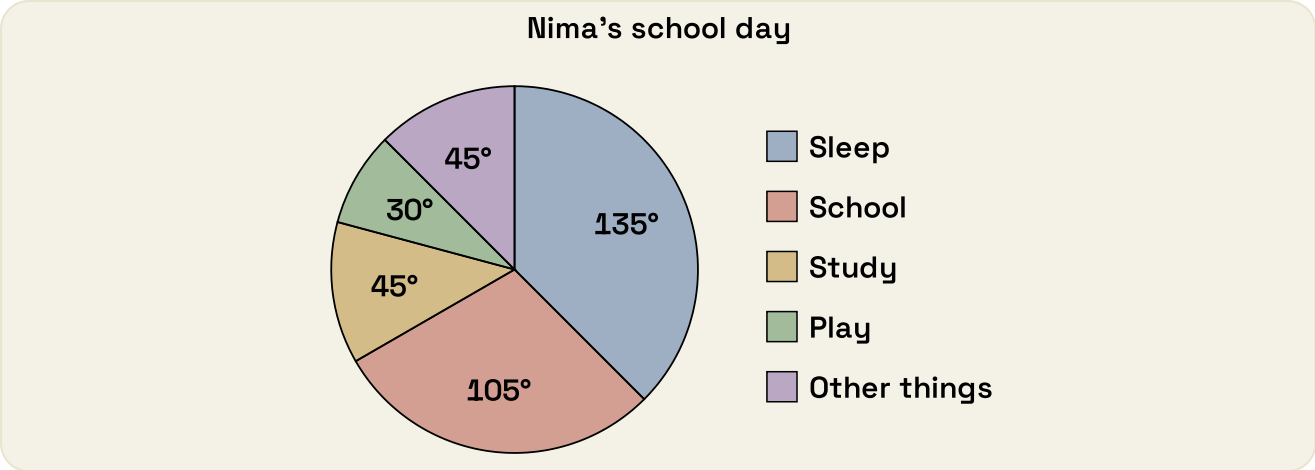


Figure 9 Drawn with a protractor, with a key and a title.

Marking scheme

- The five angles: 135°, 105°, 45°, 30° and 45°.
- The pie chart drawn with those angles, with a key and a title.

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