Grade 8 Math Model Paper 9

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 **empty set** is a set with no elements. It is written $\{\}$ or $\varnothing$. **[1]**

Marking scheme

- A set with no elements.

b. This is everything inside the circles: $K \cup L = \{\text{Sun, Mon, Tue, Wed, Thu, Sat}\}$. **[1]**

Marking scheme

- $\{\text{Sun, Mon, Tue, Wed, Thu, Sat}\}$.

c. **No.** $K \cup L$ isn't the whole of U: Friday is outside both circles, so neither town has a market on that day. **[1]**

Marking scheme

- No, with the reason (Fri is in neither set).

Question 2 — 5 marks

a. **[1]**

$$\text{Loss percent} = \frac{\text{L}}{\text{CP}} \times 100\%$$

Marking scheme

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

b. Cost $= 20 \times 800 = 16000$. Sales $= 15 \times 1000 + 5 \times 600 = 18000$. **[2]**

Profit $= 18000 - 16000 = 2000$, and

$$\text{Profit percent} = \frac{2000}{16000} \times 100\% = 12.5\%$$

12.5%.

Marking scheme

- The cost Rs 16,000 and the sales Rs 18,000.
- 12.5%.

c. The ratio is $9600{:}6400 = 3{:}2$, so of Rs 2,000 there are 5 parts of Rs 400. **[2]**

Jitendra's share is $3 \times 400 = 1200$ and his partner's $2 \times 400 = 800$. **No: Jitendra should get Rs 1,200, which is Rs 200 more than he would.**

Marking scheme

- The ratio $3{:}2$.
- Rs 1,200 and Rs 800, so it isn't fair to Jitendra.

Question 3 — 5 marks

a. **[1]**

$$I = \frac{25000 \times 1 \times 8}{100} = 2000$$

Rs 2,000.

Marking scheme

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

- Rs 2,000.

b. Less cloth for each, more uniforms: **[2]**

$$\text{Uniforms} = \frac{2.4}{1.8} \times 30 = 40$$

40 uniforms.

Marking scheme

- $\frac{2.4}{1.8} \times 30$ (or the roll is 72 m long).
- 40 uniforms.

c. **[1]**

$$2.5 \times 10^{-3} \times 4 \times 10^{3} = 10 \times 10^{0} = 10$$

10 m.

Marking scheme

- 10 m.

d. **No.** The quinary number system uses only the digits 0, 1, 2, 3 and 4, so a 7 can't appear in it. **[1]**

Marking scheme

- No, with the reason (7 isn't a digit of the quinary number system).

Question 4 — 4 marks

a. A **rational number** is a number that can be written as $\frac{p}{q}$, where p and q are integers and $q \neq 0$. **[1]**

Marking scheme

- A number of the form $\frac{p}{q}$, with p and q integers and $q \neq 0$.

b. $\sqrt{7}$ **and** π**.** Their decimals never end or repeat. $\sqrt{16} = 4$, $0.125 = \frac{1}{8}$, and $0.\overline{135}$ repeats. **[1]**

Marking scheme

- $\sqrt{7}$ and π.

c. Let $x = 0.135135\ldots$ (i). Three digits repeat, so multiply by 1000: $1000x = 135.135135\ldots$ (ii). **[2]**

Subtracting (i) from (ii): $999x = 135$, so

$$x = \frac{135}{999} = \frac{5}{37}$$

$0.\overline{135} = \frac{5}{37}$.

Marking scheme

- $999x = 135$, from multiplying by 1000 and subtracting.
- $x = \frac{5}{37}$.

Question 5 — 5 marks

a. **[1]**

$$A = \frac{1}{2} \times b \times h$$

Marking scheme

- $A = \frac{1}{2} \times b \times h$.

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

b. [1]

$$A = \frac{1}{2} \times 40 \times 30 = 600$$

600 m².

Marking scheme

- 600 m².

c. The cow can reach a quarter of a circle of radius 14 m: [2]

$$\frac{1}{4} \times \frac{22}{7} \times 14 \times 14 = 154$$

It can't reach $600 - 154 =$ **446 m²**.

Marking scheme

- The quarter circle, 154 m².
- 446 m².

d. Let h be the distance from A to BC. The area is also $\frac{1}{2} \times 50 \times h$, so $25h = 600$ and $h = 24$ m. **No:** the nearest point of BC is 24 m from A, and the rope is only 21 m. [1]

Marking scheme

- No, with the distance of 24 m from A to BC as the reason.

Question 6

3 marks

a. [1]

$$\frac{x^n}{y^n}$$

Marking scheme

- $\frac{x^n}{y^n}$.

b. The denominators are the same, so [2]

$$\frac{x^2}{x-y} - \frac{y^2}{x-y} = \frac{x^2 - y^2}{x-y} = \frac{(x+y)(x-y)}{x-y} = x + y$$

$x + y$

Marking scheme

- $\frac{x^2 - y^2}{x-y}$, with the top factorized.
- $x + y$.

Question 7

3 marks

a. $y = 3x - 5$ [1]

Marking scheme

- $y = 3x - 5$.

b. For $x + y = 7$, that is $y = 7 - x$: [2]

x	0	2	7
y	7	5	0

For $y = 3x - 5$:

x	1	2	3
y	-2	1	4

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

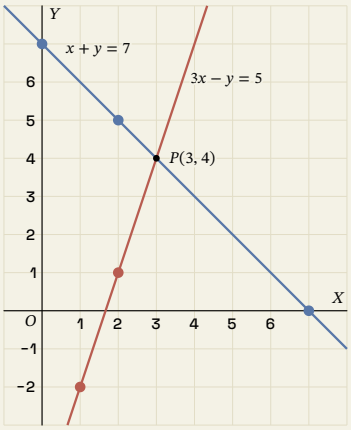


Figure 3 The two lines cross at $(3, 4)$.

The lines cross at $(3, 4)$. Check: $3 + 4 = 7$ ✓ and $3 \times 3 - 4 = 5$ ✓. **The numbers are $x = 3$ and $y = 4$.**

Marking scheme

- Both tables, and both lines drawn on the graph.
- $x = 3, y = 4$, read from where they cross.

Question 8

4 marks

a. $3 \times 8 = 24$, and two numbers that multiply to 24 and add up to -10 are -6 and -4. **[2]**

$$\begin{aligned} 3x^2 - 10x + 8 &= 3x^2 - 6x - 4x + 8 \\ &= 3x(x - 2) - 4(x - 2) \\ &= (x - 2)(3x - 4) \end{aligned}$$

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

Marking scheme

- The middle term split: $3x^2 - 6x - 4x + 8$.
- $(x - 2)(3x - 4)$.

b. The card is $(12 + 2x)$ cm long and $(8 + 2x)$ cm wide, so $(12 + 2x)(8 + 2x) = 140$. **[2]**

$$\begin{aligned} 96 + 40x + 4x^2 &= 140 \\ x^2 + 10x - 11 &= 0 \\ (x + 11)(x - 1) &= 0 \end{aligned}$$

So $x = -11$ or $x = 1$. A width can't be negative. **No: the border is 1 cm wide.** Check: $14 \times 10 = 140$ ✓.

Marking scheme

- The equation $x^2 + 10x - 11 = 0$, factorized.
- No: $x = 1$, with the negative root left out.

Question 9

4 marks

a. **Pythagoras' theorem.** **[1]**

Marking scheme

- Pythagoras' theorem.

b. $\angle AGH$ and $\angle DHG$ are alternate angles, which are equal between parallel lines. **[2]**

$$4x + 5 = 2x + 45$$

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

$$2x = 40$$

$x = 20$, and each angle is $85°$.

Marking scheme

- $4x + 5 = 2x + 45$, with the reason (alternate angles).
- $x = 20$.

c. **No.** The diagonals of a kite cross at right angles too, and a kite needn't be a rhombus. For a rhombus, the diagonals must also cut each other in half. **[1]**

Marking scheme

- No, with the reason (a kite's diagonals also cross at right angles).

Question 10 — 5 marks

a. On paper, the length is $30 \div 5 = 6$ cm and the width is $20 \div 5 = 4$ cm. **[3]**

Draw a rectangle 6 cm by 4 cm, with right angles at its corners, and write the scale beside it. Draw a diagonal and measure it: about 7.2 cm. So the real diagonal is about $7.2 \times 5 = \mathbf{36\ m}$.

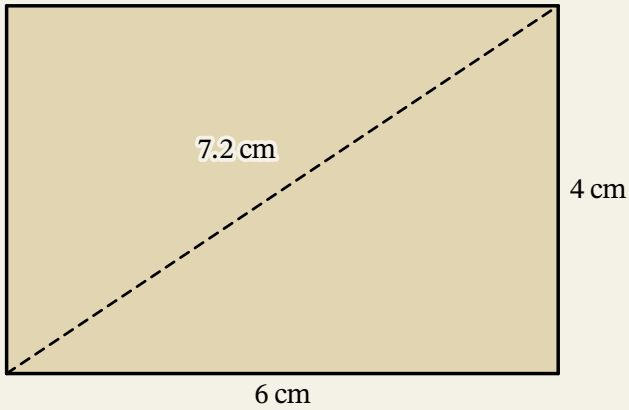


Figure 5 The ground at 1 cm = 5 m (drawn smaller here).

Marking scheme

- The lengths on paper: 6 cm and 4 cm.
- The rectangle drawn with those sides, and the scale written.
- A diagonal of about 36 m (35 m to 37 m).

b. For similar rectangles, the corresponding sides must be in the same ratio. **[2]**

$$\frac{45}{30} = \frac{3}{2}, \qquad \frac{25}{20} = \frac{5}{4}$$

No. The ratios are different, so one ground isn't an enlargement of the other: they aren't the same shape.

Marking scheme

- The two ratios, $\frac{45}{30} = \frac{3}{2}$ and $\frac{25}{20} = \frac{5}{4}$.
- No, because the ratios of the corresponding sides are different.

Question 11 — 6 marks

a. **A cone.** **[1]**

Marking scheme

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

- A cone.

b. Each interior angle of a regular pentagon is $\frac{(5-2)\times 180^\circ}{5} = 108^\circ$. **[2]**

At a corner the angles must add up to 360∘, and $360 \div 108$ isn't a whole number: three leave a gap of 36∘, and a fourth won't fit. **So it isn't possible.**

Marking scheme

- Each interior angle is 108∘.
- Not possible, because 108∘ doesn't divide 360∘ exactly.

c. Through -90∘, $(x, y) \to (y, -x)$. So $K(1, 1) \to K'(1, -1)$, $L(4, 1) \to L'(1, -4)$, $M(5, 3) \to M'(3, -5)$ and $N(2, 3) \to N'(3, -2)$. **[3]**

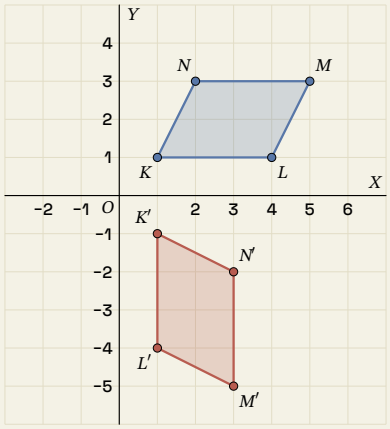


Figure 7 $KLMN$ and its image.

$K'(1, -1)$, $L'(1, -4)$, $M'(3, -5)$ **and** $N'(3, -2)$.

Marking scheme

- The rule used, $(x, y) \to (y, -x)$, or the vertices read correctly.
- $K'(1, -1)$, $L'(1, -4)$, $M'(3, -5)$ and $N'(3, -2)$.
- The image drawn and named on the graph.

Question 12 — 3 marks

a. In order: 0, 1, 1, 2, 2, 2, 3, 3, 4. The middle one of nine values is the fifth. **The median is 2.** **[1]**

Marking scheme

- 2.

b. **[2]**

$$\overline{X} = \frac{2+0+3+1+2+4+2+1+3}{9} = \frac{18}{9} = 2$$

The mean is 2. With the tenth match, the total is $18 + 8 = 26$ goals in 10 matches, so the new mean is $26 \div 10 = \mathbf{2.6}$.

Marking scheme

- The mean is 2.
- The new mean is 2.6.

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking