# Grade 8 Math Model Paper 6

**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.** $\mathrm{E} \in R$ **[1]**

**Marking scheme**

- $\mathrm{E} \in R$.

**b.** These are in the overlap of the two circles: $\{\mathrm{E}, \mathrm{Ma}\}$. **[1]**

**Marking scheme**

- $\{\mathrm{E}, \mathrm{Ma}\}$.

**c.** **No.** For $R \subset M$, every element of $R$ must be in $M$. Mercury and Venus are in $R$ but not in $M$, so $R$ isn't a subset of $M$. The two sets overlap. **[1]**

**Marking scheme**

- No, with the reason (Me and V are in $R$ but not in $M$).

## Question 2 — 4 marks

**a.** A **ratio** compares two quantities of the same kind by division: it says how many times one is of the other. **[1]**

**Marking scheme**

- A comparison of two quantities of the same kind, by division.

**b.** In the same unit, 1.5 m $= 150$ cm, so the ratio is $150{:}75 = 2{:}1$. **[1]**

**Marking scheme**

- $2{:}1$.

**c.** There are $2 + 3 + 4 = 9$ parts, so 1 part is $63000 \div 9 = 7000$. **[2]**

The shares are $2 \times 7000 =$ **Rs 14,000**, $3 \times 7000 =$ **Rs 21,000** and $4 \times 7000 =$ **Rs 28,000**.

**Marking scheme**

- 1 part is Rs 7,000.
- The shares: Rs 14,000, Rs 21,000 and Rs 28,000.

## Question 3 — 5 marks

**a.** **9% a year.** **[1]**

**Marking scheme**

- 9% a year.

**b.** 2 years 6 months $= 2.5$ years. **[2]**

$$R = \frac{I \times 100}{P \times T} = \frac{12000 \times 100}{60000 \times 2.5} = 8$$

**8% a year.**

**Marking scheme**

- The values put in the formula for $R$, with the time as 2.5 years.
- 8% a year.

**c.** Bank: $I = \dfrac{30000 \times 2 \times 12}{100} = 7200$. **[2]**



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Cooperative: $I = \dfrac{30000 \times 2 \times 10}{100} = 6000$, and with the fee $6000 + 1000 = 7000$.

**The cooperative's loan costs him less,** by Rs 200, even with its fee.

**Marking scheme**

- The two costs, Rs 7,200 and Rs 7,000.
- The cooperative, because its total cost is lower.

## Question 4 — 5 marks

**a.** **[1]**

$$18500 - \frac{20}{100} \times 18500 = 18500 - 3700 = 14800$$

**Rs 14,800.**

**Marking scheme**

- Rs 14,800.

**b.** **[2]**

$$\frac{2 \times 10^3}{5 \times 10^{-5}} = \frac{2}{5} \times 10^{3+5} = 0.4 \times 10^8 = 4 \times 10^7$$

$4 \times 10^7$ **drops.**

**Marking scheme**

- $0.4 \times 10^8$, dividing the numbers and subtracting the powers.
- $4 \times 10^7$.

**c.** **[1]**

$$1011101_2 = 64 + 16 + 8 + 4 + 1 = 93$$

**93.**

**Marking scheme**

- 93.

**d.** **Yes.** More taps, less time: 5 taps take $\dfrac{4}{5} \times 6 = 4.8$ hours, which is less than 5 hours. **[1]**

**Marking scheme**

- Yes, with the 4.8 hours as the reason.

## Question 5 — 5 marks

**a.** **[1]**

$$A = \frac{b}{4}\sqrt{4a^2 - b^2}$$

**Marking scheme**

- $A = \dfrac{b}{4}\sqrt{4a^2 - b^2}$.

**b.** **[1]**

$$A = \frac{30}{4}\sqrt{4 \times 25^2 - 30^2} = \frac{30}{4}\sqrt{1600} = \frac{30}{4} \times 40 = 300$$

**300 cm².**

**Marking scheme**

- 300 cm².

**c.** 40 flags are $40 \times 300 = 12000$ cm². Since 1 m² $= 10000$ cm², that is 1.2 m². **[2]**

Cost $= 1.2 \times 150 =$ **Rs 180**.

**Marking scheme**



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- 12,000 cm², or 1.2 m².
- Rs 180.

**d.** **No.** The bases take up $40 \times 30 = 1200$ cm $= 12$ m, and the string is only 10 m long. **[1]**

**Marking scheme**

- No, with 12 m compared with 10 m.

## Question 6 — 3 marks

**a.** $x^n y^n$ **[1]**

**Marking scheme**

- $x^n y^n$.

**b.** **[2]**

$$\frac{x^2-4}{x+3} \div \frac{x-2}{x^2-9} = \frac{(x+2)(x-2)}{x+3} \times \frac{(x+3)(x-3)}{x-2}$$
$$= (x+2)(x-3)$$

$(x+2)(x-3)$

**Marking scheme**

- Turned into a product, with both $x^2-4$ and $x^2-9$ factorized.
- $(x+2)(x-3)$.

## Question 7 — 3 marks

**a.** **One solution:** two straight lines that cross meet at just one point. **[1]**

**Marking scheme**

- One.

**b.** For $x + y = 1$, that is $y = 1 - x$: **[2]**

| $x$ | $-1$ | 0 | 1 |
|---|---|---|---|
| $y$ | 2 | 1 | 0 |

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

| $x$ | 0 | 2 | 5 |
|---|---|---|---|
| $y$ | $-5$ | $-3$ | 0 |

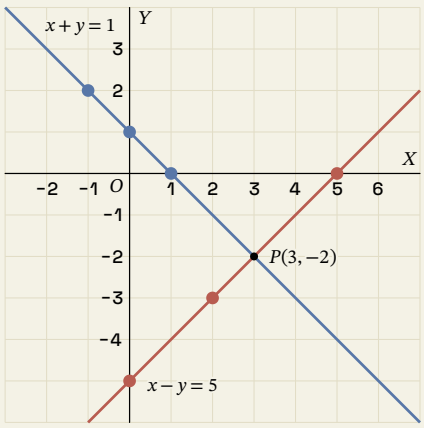



**Figure 3** The two lines cross at $(3, -2)$.

The lines cross at $(3, -2)$. Check: $3 + (-2) = 1$ ✓ and $3 - (-2) = 5$ ✓. $x = 3, y = -2$.

**Marking scheme**


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- Both tables, and both lines drawn on the graph.
- $x = 3, y = -2$, read from where they cross.

## Question 8 — 4 marks

**a.** **[2]**

$$x^2 - 1 = (x+1)(x-1)$$
$$x^2 + x = x(x+1)$$

**LCM** $= x(x+1)(x-1)$**.** The shared factor $(x+1)$ is counted once.

**Marking scheme**

- Both expressions factorized.
- LCM $= x(x+1)(x-1)$.

**b.** $\frac{n(n+1)}{2} = 66$, so $n^2 + n - 132 = 0$, and **[2]**

$$(n+12)(n-11) = 0$$

So $n = -12$ or $n = 11$. A number of rows can't be negative. **Yes: 66 bricks make exactly 11 complete rows.** Check: $\frac{11 \times 12}{2} = 66$ ✓.

**Marking scheme**

- The equation $n^2 + n - 132 = 0$, factorized.
- Yes, with $n = 11$ rows and the negative root left out.

## Question 9 — 4 marks

**a.** $F + V = E + 2$ **[1]**

**Marking scheme**

- $F + V = E + 2$.

**b.** The exterior angles add up to 360∘, so the number of sides is $360^\circ \div 40^\circ =$ **9**. **[2]**

Each interior angle is $180^\circ - 40^\circ =$ **140∘**.

**Marking scheme**

- 9 sides.
- 140∘.

**c.** **[1]**

$$WA = \sqrt{(-1-2)^2 + (7-3)^2} = \sqrt{9+16} = 5, \qquad WB = \sqrt{(8-2)^2 + (3-3)^2} = 6$$

**Yes.** The tap is 5 m away and the well 6 m.

**Marking scheme**

- Yes, with $WA = 5$ m and $WB = 6$ m as the reason.

## Question 10 — 5 marks

**a.** At 1 cm = 1 km, $AB = 8$ cm and $BC = 6$ cm. **[3]**

Mark $A$ and draw a north line. Measure 60∘ clockwise from it, and draw $AB = 8$ cm. At $B$, draw another north line, measure 150∘ clockwise from it, and draw $BC = 6$ cm. Join $AC$, and write the scale beside the drawing.


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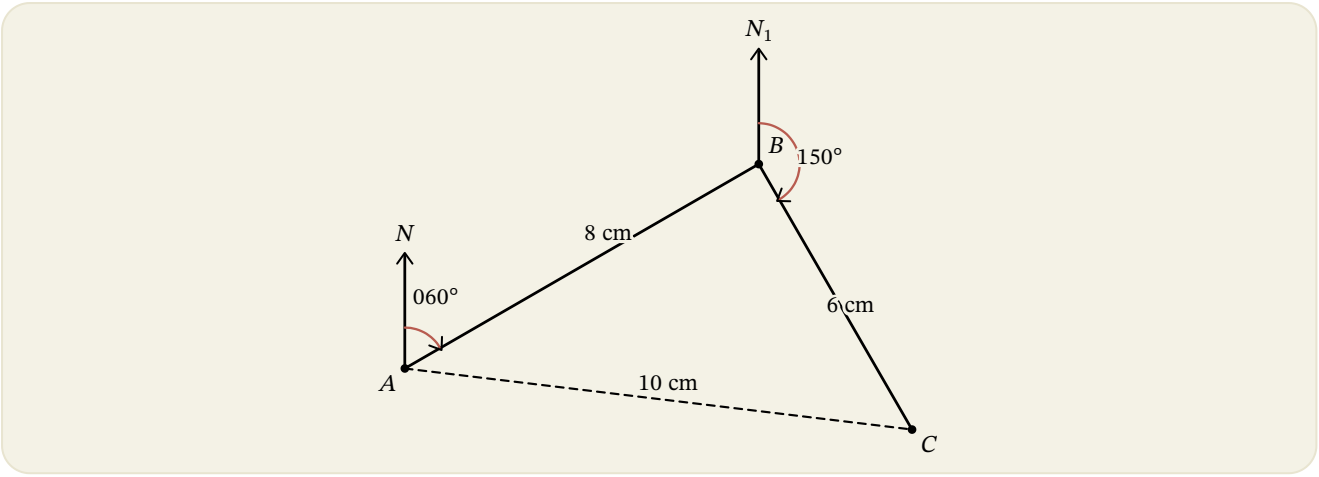



**Figure 4** The walk at 1 cm = 1 km (drawn smaller here).

$AC$ measures 10 cm, so the distance is **10 km**. (The turn at $B$ is a right angle, and $\sqrt{8^2 + 6^2} = 10$ ✓.)

**Marking scheme**

- $AB = 8$ cm at 060° from $A$.
- $BC = 6$ cm at 150° from $B$, with its own north line, and the scale written.
- The distance $AC$ is 10 km.

**b.** The Sun's rays come at the same slant, and the tower and the pole both stand upright, so $\triangle TUV$ and $\triangle PQR$ are similar. Their corresponding sides are in proportion: **[2]**

$$\frac{TU}{PQ} = \frac{UV}{QR}, \qquad \frac{TU}{2} = \frac{27}{3}, \qquad TU = 18$$

The tower is 18 m tall. **Yes: the rope of 20 m will reach, with 2 m to spare.**

**Marking scheme**

- The similar triangles, with $\dfrac{TU}{2} = \dfrac{27}{3}$.
- The tower is 18 m tall, so yes.

## Question 11 — 6 marks

**a.** **Alternate angles.** **[1]**

**Marking scheme**

- Alternate angles.

**b.** Going round a corner: a triangle, a square, a hexagon and a square, so it is **3.4.6.4**. It uses more than one kind of regular polygon, with the same arrangement at every corner, so it is **semi-regular**. **[2]**

**Marking scheme**

- 3.4.6.4.
- Semi-regular.

**c.** Through +90°, $(x, y) \to (-y, x)$. So $A(2, 1) \to A'(-1, 2)$, $B(6, 2) \to B'(-2, 6)$ and $C(3, 5) \to C'(-5, 3)$. **[3]**



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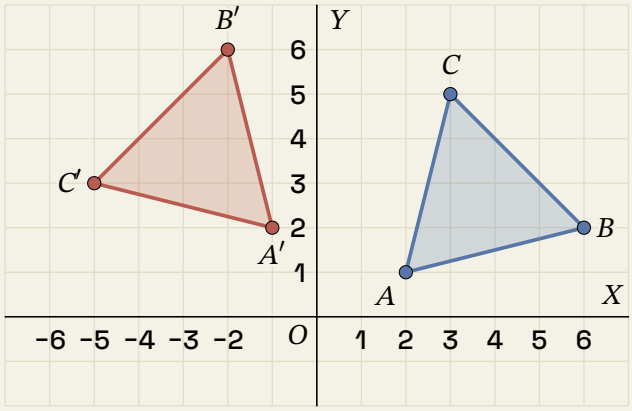



**Figure 8** $\triangle ABC$ and its image.

$A'(-1,\,2)$**,** $B'(-2,\,6)$ **and** $C'(-5,\,3)$**.**

**Marking scheme**

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

## Question 12

**3 marks**

**a.** **[1]**

$$\overline{X} = \frac{900 + 1100 + 1000 + 1200 + 800 + 7000}{6} = \frac{12000}{6} = 2000$$

**Rs 2,000.**

**Marking scheme**

- Rs 2,000.

**b.** In order: 800, 900, 1000, 1100, 1200, 7000. There are six values, so the median is the mean of the third and the fourth: **[2]**

$$\text{Median} = \frac{1000 + 1100}{2} = 1050$$

**The median is Rs 1,050.** It tells better what an ordinary day is like: five of the six days are below the mean of Rs 2,000, which the fair day has pulled up.

**Marking scheme**

- The median is Rs 1,050.
- The median, because the one fair day pulls the mean up.



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