Grade 8 Math Model Paper 3

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. $E \subset F$ **[1]**

Marking scheme

- $E \subset F$.

b. $\{1, 3\}$ **[1]**

Marking scheme

- $\{1, 3\}$.

c. **1 and 3.** An improper subset has all the elements of the set. With 1 and 3 added, $E = \{1, 2, 3, 4, 6, 12\} = F$, so $E \subseteq F$. **[1]**

Marking scheme

- 1 and 3, with the reason (an improper subset has all the elements of F).

Question 2 — 4 marks

a. **Indirect variation** is when one quantity increases and the other decreases by the same factor, and the other way round: twice the workers, half the days. **[1]**

Marking scheme

- One quantity increases as the other decreases, by the same factor.

b. More workers, fewer days, so **[1]**

$$x = \frac{18}{24} \times 20 = 15$$

15 days.

Marking scheme

- 15 days.

c. After 8 days, the work left would take 18 workers $20 - 8 = 12$ days. Now $18 - 6 = 12$ workers are left. **[2]**

$$x = \frac{18}{12} \times 12 = 18$$

So the rest takes 18 days, and the whole work takes $8 + 18 =$ **26 days**.

Marking scheme

- The rest takes 18 days, by 12 workers.
- The whole work takes 26 days.

Question 3 — 5 marks

a. On the **marked price**. **[1]**

Marking scheme

- The marked price.

b. Discount $= \frac{12}{100} \times 30000 = 3600$, so the selling price is $30000 - 3600 = 26400$. **[2]**

Profit $= 26400 - 24000 = 2400$, and

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$$\text{Profit percent} = \frac{2400}{24000} \times 100\% = 10\%$$

A profit of 10%.

Marking scheme

- Selling price Rs 26,400.
- A profit of 10%.

c. The interest in one year is $\frac{26400 \times 1 \times 10}{100} = 2640$, so in 2 years it is 5,280 and she has $26400 + 5280 = 31680$. **No: she is Rs 1,320 short.** **[2]**

Rs 1,320 is half of a year's interest, so **she must wait 6 months longer.** Check: in 2.5 years the interest is Rs 6,600, and $26400 + 6600 = 33000$ ✓.

Marking scheme

- Rs 31,680 after 2 years, so not enough.
- 6 months longer.

Question 4 — 5 marks

a. The point moves 5 places to the right: 9×10^{-5} **m.** **[1]**

Marking scheme

- 9×10^{-5} m.

b. **[2]**

$$500 \times 9 \times 10^{-5} = 5 \times 10^{2} \times 9 \times 10^{-5} = 45 \times 10^{-3} = 4.5 \times 10^{-2}$$

4.5×10^{-2} **m**, that is 4.5 cm.

Marking scheme

- 45×10^{-3}, multiplying the numbers and adding the powers.
- 4.5×10^{-2} m.

c. 5 parts are 40 cm, so 1 part is 8 cm, and the other is $3 \times 8 =$ **24 cm.** **[1]**

Marking scheme

- 24 cm.

d. $1011_2 = 8 + 2 + 1 = 11$ and $23_5 = 2 \times 5 + 3 = 13$. **The bundle labeled 23_5 holds more**, by 2 sheets. **[1]**

Marking scheme

- 23_5, with both changed to decimal (11 and 13).

Question 5 — 5 marks

a. **[1]**

$$A = \frac{1}{2} d(h_1 + h_2)$$

Marking scheme

- $A = \frac{1}{2} d(h_1 + h_2)$.

b. **[1]**

$$A = \frac{1}{2} \times 50 \times (18 + 12) = 750$$

750 m².

Marking scheme

- 750 m².

c. $2\pi r = 31.4$, so $r = \frac{31.4}{2 \times 3.14} = 5$ m, and the pond's area is $3.14 \times 5 \times 5 = 78.5$ m². **[2]**

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Area except the pond $= 750 - 78.5 =$ **671.5 m²**.

Marking scheme

- The radius 5 m and the pond's area, 78.5 m².
- 671.5 m².

d. One tenth of the plot is $750 \div 10 = 75$ m², and the pond is 78.5 m². **Yes, by 3.5 m².** **[1]**

Marking scheme

- Yes, with 78.5 m² compared with 75 m².

Question 6 — 3 marks

a. When its numerator and denominator have **no common factor** except 1. **[1]**

Marking scheme

- When the numerator and denominator have no common factor except 1.

b. **[2]**

$$\frac{(3x^2)^3 \times x^{-2}}{9x^3} = \frac{27x^6 \times x^{-2}}{9x^3} = \frac{27x^4}{9x^3} = 3x$$

$3x$

Marking scheme

- $(3x^2)^3 = 27x^6$.
- $3x$.

Question 7 — 3 marks

a. **A quadratic equation:** an equation in one variable of degree 2. **[1]**

Marking scheme

- A quadratic equation.

b. Two numbers that multiply to -28 and add up to -3 are -7 and 4. **[2]**

$$\begin{aligned} x^2 - 7x + 4x - 28 &= 0 \\ x(x-7) + 4(x-7) &= 0 \\ (x-7)(x+4) &= 0 \end{aligned}$$

So $x = 7$ **or** $x = -4$. Check: $49 - 21 - 28 = 0$ ✓ and $16 + 12 - 28 = 0$ ✓.

Marking scheme

- Factorized: $(x - 7)(x + 4) = 0$.
- $x = 7$ or $x = -4$.

Question 8 — 4 marks

a. $6 \times (-3) = -18$, and two numbers that multiply to -18 and add up to 7 are 9 and -2. **[2]**

$$\begin{aligned} 6x^2 + 7x - 3 &= 6x^2 + 9x - 2x - 3 \\ &= 3x(2x+3) - 1(2x+3) \\ &= (2x+3)(3x-1) \end{aligned}$$

$(2x + 3)(3x - 1)$

Marking scheme

- The middle term split: $6x^2 + 9x - 2x - 3$.
- $(2x + 3)(3x - 1)$.

b. Let the breadth be x m. Then $x(x + 2) = 24$, so $x^2 + 2x - 24 = 0$, and **[2]**

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$$(x+6)(x-4)=0$$

So $x=-6$ or $x=4$. A breadth can't be negative, so $x=4$. **The breadth is 4 m and the length is 6 m.** Check: $4\times 6=24$ ✓.

Marking scheme

- The equation $x^2+2x-24=0$, factorized.
- Breadth 4 m and length 6 m, with the negative root left out.

Question 9

4 marks

a. A floor of **two or more kinds of regular polygon**, whole sides meeting whole sides, with **the same arrangement at every corner**. **[1]**

Marking scheme

- Two or more kinds of regular polygon, with the same arrangement at every corner.

b. The sum of its interior angles is $(12-2)\times 180^\circ=1800^\circ$, so each is $1800^\circ\div 12=$ **150∘**. (Check at a corner of the floor: $60^\circ+150^\circ+150^\circ=360^\circ$ ✓.) **[2]**

Marking scheme

- The sum 1800∘, from $(n-2)\times 180^\circ$.
- 150∘.

c. $\angle BGH$ and $\angle DHG$ are co-interior angles, and $150^\circ+30^\circ=180^\circ$. **Yes, they are parallel:** when co-interior angles add up to 180∘, the lines are parallel. **[1]**

Marking scheme

- Yes, with the reason (the co-interior angles add up to 180∘).

Question 10

5 marks

a. On paper, $AB=60\div 10=6$ cm, $BC=8$ cm and $AC=10$ cm. **[3]**

Draw $BC=8$ cm. With center B and radius 6 cm, and center C and radius 10 cm, draw arcs that meet at A. Join AB and AC, and write the scale beside the drawing. With a protractor, $\angle ABC=90^\circ$.

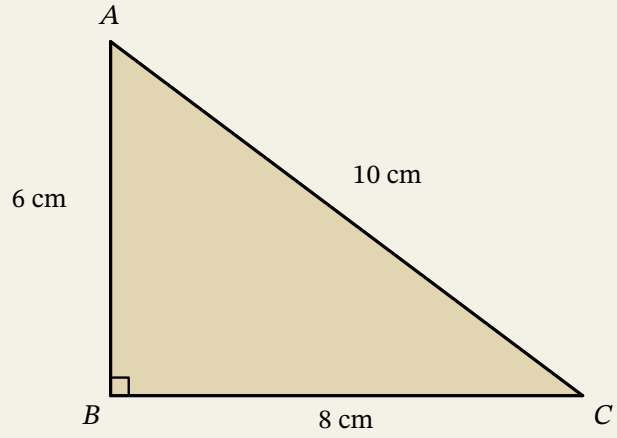


Figure 5 The park at 1 cm = 10 m (drawn smaller here).

Marking scheme

- The lengths on paper: 6 cm, 8 cm and 10 cm.
- The triangle drawn with those sides, and the scale written.
- $\angle ABC=90^\circ$.

b. The corresponding sides are in proportion, and $\dfrac{PQ}{AB}=\dfrac{45}{60}=\dfrac{3}{4}$. So **[2]**

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$$QR = \frac{3}{4} \times 80 = 60 \text{ m}, \qquad PR = \frac{3}{4} \times 100 = 75 \text{ m}$$

Fencing $= 45 + 60 + 75 =$ **180 m.**

Marking scheme

- The ratio $\frac{3}{4}$, with $QR = 60$ m and $PR = 75$ m.
- 180 m.

Question 11 — 6 marks

a. **4 faces**, all triangles. **[1]**

Marking scheme

- 4.

b. $P(-1, 2)$ and $Q(-5, 5)$. **[2]**

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

5 units.

Marking scheme

- The coordinates read and put in the distance formula.
- 5 units.

c. Through -90∘, $(x, y) \to (y, -x)$. So $P(-1, 2) \to P'(2, 1), Q(-5, 5) \to Q'(5, 5)$ and $R(-1, 5) \to R'(5, 1)$. **[3]**

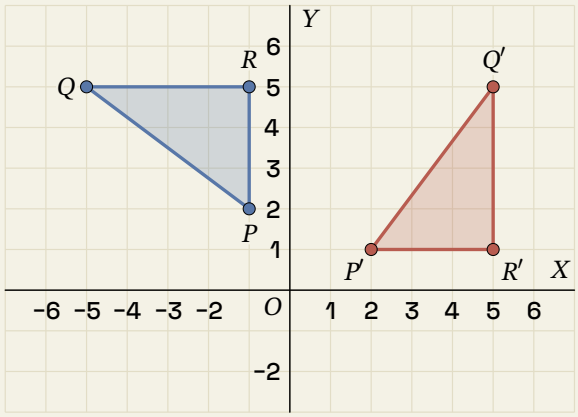


Figure 7 $\triangle PQR$ and its image.

$P'(2, 1)$**,** $Q'(5, 5)$ **and** $R'(5, 1)$**.**

Marking scheme

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

Question 12 — 3 marks

a. **[1]**

$$\frac{150}{360} \times 240 = 100$$

100 students.

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Marking scheme

- 100 students.

b. By bus: $\frac{90}{360} \times 240 = 60$. So $100 - 60 =$ **40 more** students walk. **[2]**

The bus's share is $\frac{90}{360} = \frac{1}{4}$, which is **25%** of the students.

Marking scheme

- 60 students by bus, so 40 more walk.
- 25%.

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