

High Performance

Paper 1 Section B Question 18

18. Figure 4 shows a geometric model $ABCD$ in the form of tetrahedron. It is found that $\angle ACB = 60^\circ$, $AC = AD = 20$ cm, $BC = BD = 12$ cm and $CD = 14$ cm.

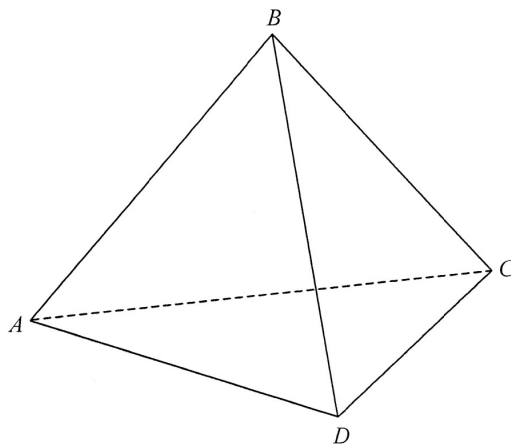


Figure 4

- (a) Find the length of AB . (2 marks)
- (b) Find the angle between the plane ABC and the plane ABD . (4 marks)
- (c) Let P be a movable point on the slant edge AB . Describe how $\angle CPD$ varies as P moves from A to B . Explain your answer. (2 marks)

$$(a) AB = \sqrt{12^2 + 20^2 - 2(12)(20)\cos 60^\circ} \quad \checkmark \quad 1M$$

$$= 17.4355958 \approx 17.4 \text{ cm} \quad \checkmark \quad 1A$$

(b) Set M on AB s.t. $DM \perp AB$, $CM \perp AB$

$$\frac{\sin \angle BAD}{12} = \frac{\sin 60^\circ}{17.4355958} \quad \checkmark \quad 1M$$

$$\angle BAD = 36.586776^\circ$$

$$CM = DM = 20 \sin 36.586776^\circ = 11.92079121 \quad \checkmark \quad 1M$$

$$\cos \angle CMD = \frac{2(11.92079121)^2 - 14^2}{2(11.92079121)^2} \quad \checkmark \quad 1M$$

$$\angle CMD = 71.918448^\circ \approx 71.9^\circ \quad \checkmark \quad 1A$$

$$(c) \because \sin \frac{\angle CPD}{2} = \frac{CD}{2CP}, \quad CP \geq CM$$

$$\therefore \angle CPD \leq \angle CMD \quad \checkmark \quad 1M$$

$\angle CPD$ inc. from A to M , then dec. from M to B .
X

Mid Performance

Paper 1 Section A(2) Question 12

12. Figure 2 shows the graphs for Ada and Billy running on the same straight road between town P and town Q during the period 1:00 to 3:00 in an afternoon. Ada runs at a constant speed. It is given that town P and town Q are 16 km apart.

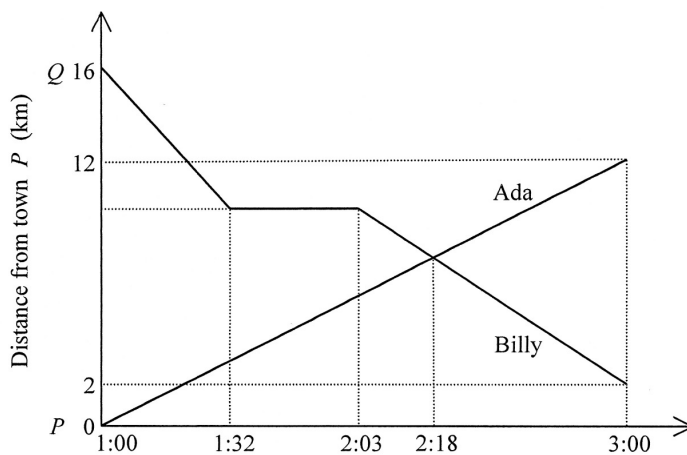


Figure 2

- (a) How long does Billy rest during the period? (2 marks)
- (b) How far from town P do Ada and Billy meet during the period? (3 marks)
- (c) Use average speed during the period to determine who runs faster. Explain your answer. (2 marks)

(a) Billy rest 31 mins. ✓ IM
IA

(b) The distance from town P
 $= \frac{14}{120} \times (60+18)$ IM
 $= 9.1 \text{ km}$ X

(c) Average speed of Ada $= \frac{12}{120} = 0.1 \text{ km/min}$ ✓ IM
 Average speed of Billy $= \frac{14}{120} = 0.117 \text{ km/min}$
 $> 0.1 \text{ km/min}$
 \therefore Billy runs faster. ✓ IA

Low Performance

Paper 1 Section A(1) Question 1

1. Simplify $\frac{(m^5 n^{-2})^6}{m^4 n^{-3}}$ and express your answer with positive indices. (3 marks)

$$\frac{m^{11} n^4}{m^4 n^{-3}}$$
$$= m^7 n^3 n^4 \quad \checkmark \quad 1M$$
$$= m^7 n^7 \quad \times$$