

Candidate's Name \_\_\_\_\_ Class \_\_\_\_\_ Index No \_\_\_\_\_



**BUKIT PANJANG GOVERNMENT HIGH SCHOOL**  
**END OF YEAR EXAMINATION 2006**  
**SEC THREE EXPRESS / NORMAL (ACADEMIC) 'O' LEVEL**

**MATHEMATICS (PAPER 1)**

Date: 6 October 2006

Duration: 1 hour 15 min

Time: 0800 - 0915

**INSTRUCTIONS TO CANDIDATES**

Write your name and index number in the space at the top of this page.

Answer ALL questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question, show it in the space below that question.

Omission of working will result in loss of marks.

**NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.**

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks of this paper is 50.

**FOR EXAMINER'S USE**

**/ 50**

This question paper consists of 10 printed pages.

- 1 -

1. Evaluate (i)  $(0.027)^{\frac{2}{3}} + \sqrt{1\frac{9}{16}}$  [2]

(ii)  $2(3 \times 10^{-4})^2$ , expressing your answer in standard form. [2]

Answer (i) \_\_\_\_\_

(ii) \_\_\_\_\_

2. (a) Simplify  $\frac{4a-3a^2}{6a^2+a-12}$  [2]

(b) Evaluate  $\sqrt{0.04} + (-2)^2 + (-2)^{-2} (-2^{-2})$  [2]

Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_

3. Given the line L has equation  $3x + 4y = 12$ , find

(i) the coordinates of the point at which it cuts the y-axis.

[1]

(ii) the equation of the line which is the image of the line L under a reflection in the line  $x = 4$ .

[2]

Answer (i) \_\_\_\_\_

(ii) \_\_\_\_\_

4. Solve, for x,  $\frac{2}{3} \left[ \frac{3}{2} \left( \frac{1}{4}x - 1 \right) - 4 \frac{1}{2} \right] = x + 2$ .

[2]

Answer \_\_\_\_\_

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5. (a) Given that  $\sqrt{2}=1.4$  and  $\sqrt{3}=1.7$ , find the value of  $\sqrt{216}$ . [2]  
(b) Correct the answer in part (a) to one significant figure. [1]

Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_

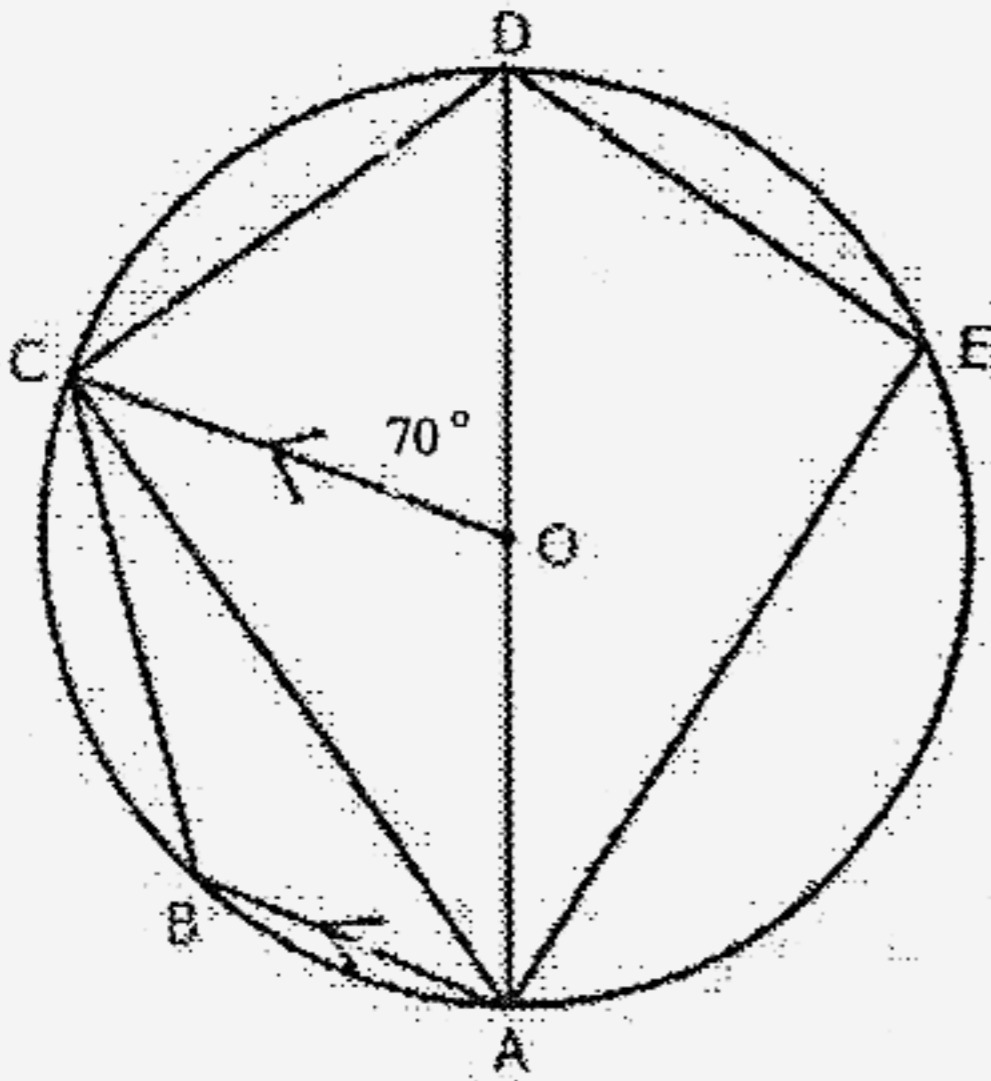
6. Find the integers which satisfy the inequalities  $2(x-1) \leq 4-x$  and  $3(x+1) < 5x+7$ . [3]

Answer \_\_\_\_\_

7. A circle, centre O, passes through A, B, C, D and E. AD is the diameter of the circle,  $\angle COD = 70^\circ$  and AB is parallel to OC.

- (i) Find
- (a)  $\angle OAC$  [1]
  - (b)  $\angle ODC$  [1]
  - (c)  $\angle ABC$  [1]
  - (d)  $\angle ACB$  [2]

(ii) X is a point on AD such that  $AX = \frac{1}{4} AD$ . Given that the area of  $\triangle EAD$  is  $90 \text{ cm}^2$ , calculate the area of  $\triangle EXD$ . [2]



Answer (i)(a) \_\_\_\_\_

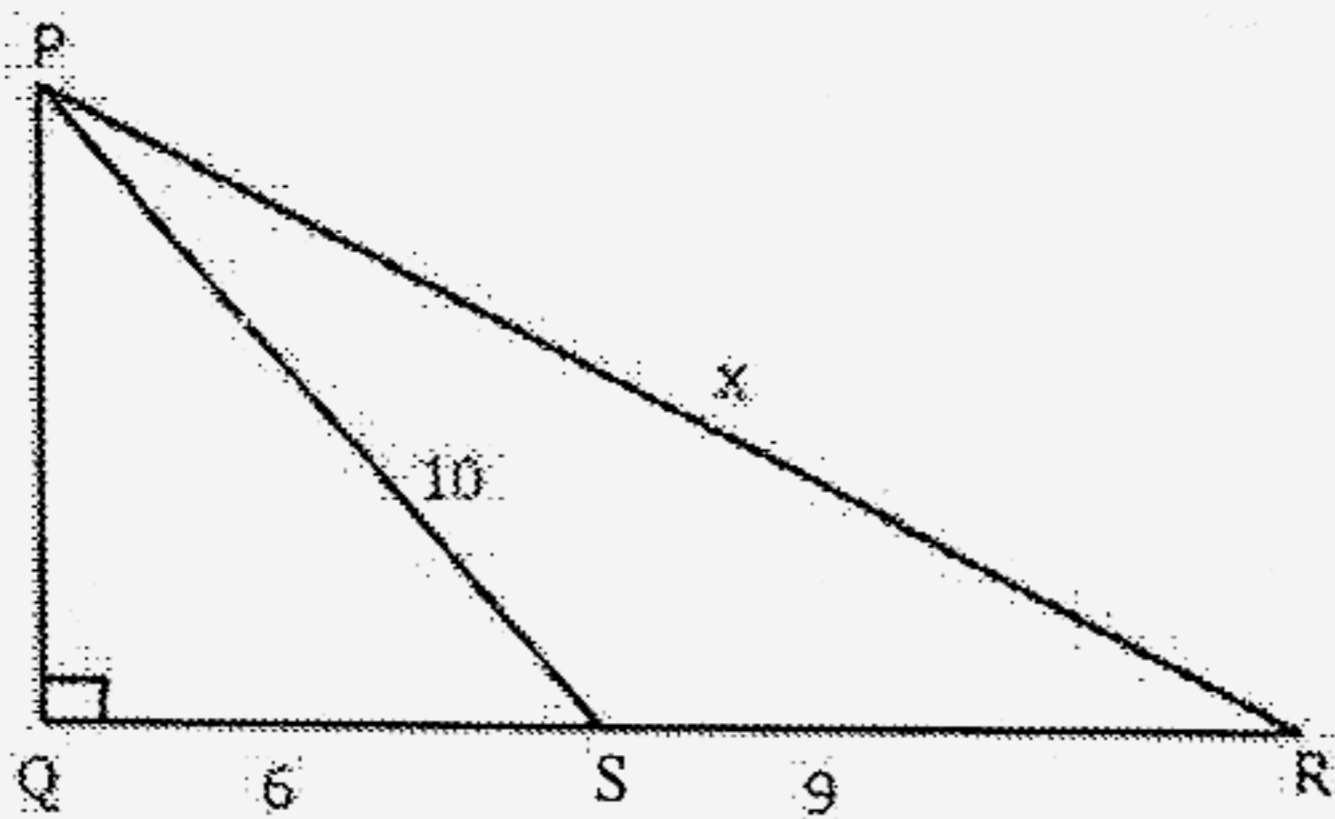
(b) \_\_\_\_\_

(c) \_\_\_\_\_

(d) \_\_\_\_\_

(ii) \_\_\_\_\_

8. In the diagram,  $\angle PQR = 90^\circ$ ,  $PR = x$  cm,  $QS = 6$  cm,  $SR = 9$  cm and  $PS = 10$  cm. Calculate
- (i) the value of  $x$ , [2]
  - (ii)  $\cos \angle PSR$ , [1]
  - (iii) the shortest distance from  $S$  to  $PR$ . [2]



Answer (i) \_\_\_\_\_

(ii) \_\_\_\_\_

(iii) \_\_\_\_\_

- 6 -

9. (a) Solve the equation  $x^{-\frac{2}{3}} = 4$ .

[2]

(b) Given that  $x = 2003$  and  $y = 2004$ , evaluate  $(x + y) \left( \frac{x^2 + y^2}{x^4 - y^4} \right)$ .

[2]

Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_

10. Given that  $87 \times 132 = 11\,484$ ,

(i) complete the statement  $88 \times 132 = 11\,484 +$  \_\_\_\_\_

[1]

(ii) write down the exact value of

(a)  $0.087 \times 13\,200$ ,

[1]

(b)  $0.11484 \div 0.0087$ .

[1]

Answer (i) \_\_\_\_\_

(ii)(a) \_\_\_\_\_

(b) \_\_\_\_\_

11. Two scale models, A and B, of a church are made. The length of model B is  $\frac{4}{5}$  the length of model A.
- (i) Given that the height of the tower in model A is 75 cm, calculate the height of the tower in model B. [1]
  - (ii) Given that the area of windows in model A is  $4000 \text{ cm}^2$ , calculate the area of the windows in model B. [2]
  - (iii) Given that the interior volume of model B is  $320000 \text{ cm}^3$ , calculate the interior volume of model A. [2]

Answer (i) \_\_\_\_\_

(ii) \_\_\_\_\_

(iii) \_\_\_\_\_



12. In the diagram below, PQ and PR are tangents to a circle with centre O. The bearing of R from P is  $040^\circ$ , and Q is due east of P,

(i) Give a brief reason why  $\angle ORP$  is  $90^\circ$ .

[1]

(ii) Calculate

(a)  $\angle QRP$ .

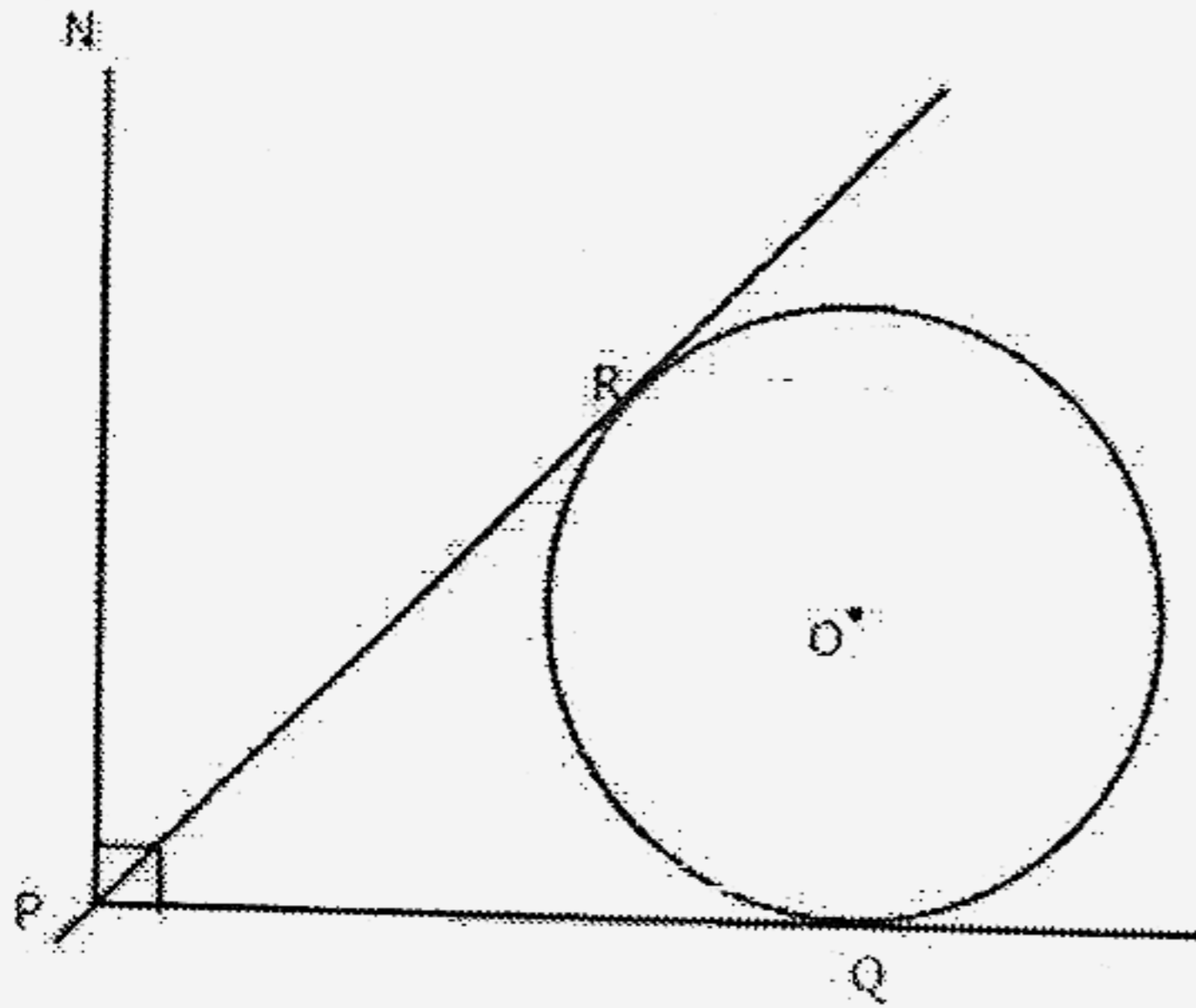
[1]

(b) the bearing of R from Q.

[1]

(c) the bearing of O from R.

[1]



Answer (i) \_\_\_\_\_

(ii)(a) \_\_\_\_\_

(b) \_\_\_\_\_

(c) \_\_\_\_\_

13. If  $2x - 3y - z = 0$  and  $x + 3y - 14z = 0$ ,  $z \neq 0$ , find the numerical value of

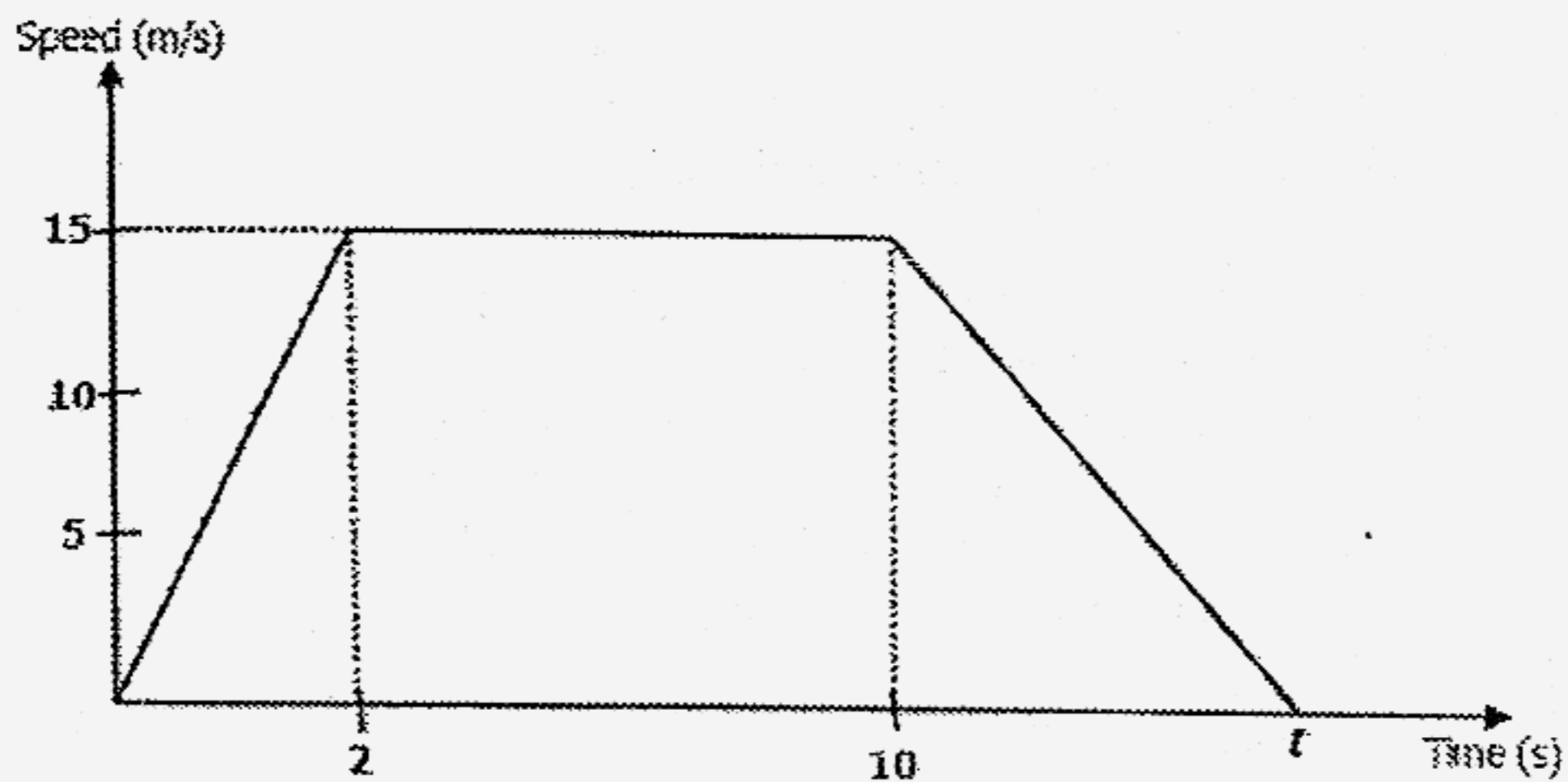
$$\frac{x^2 + 3xy}{y^2 + z^2}$$

[3]

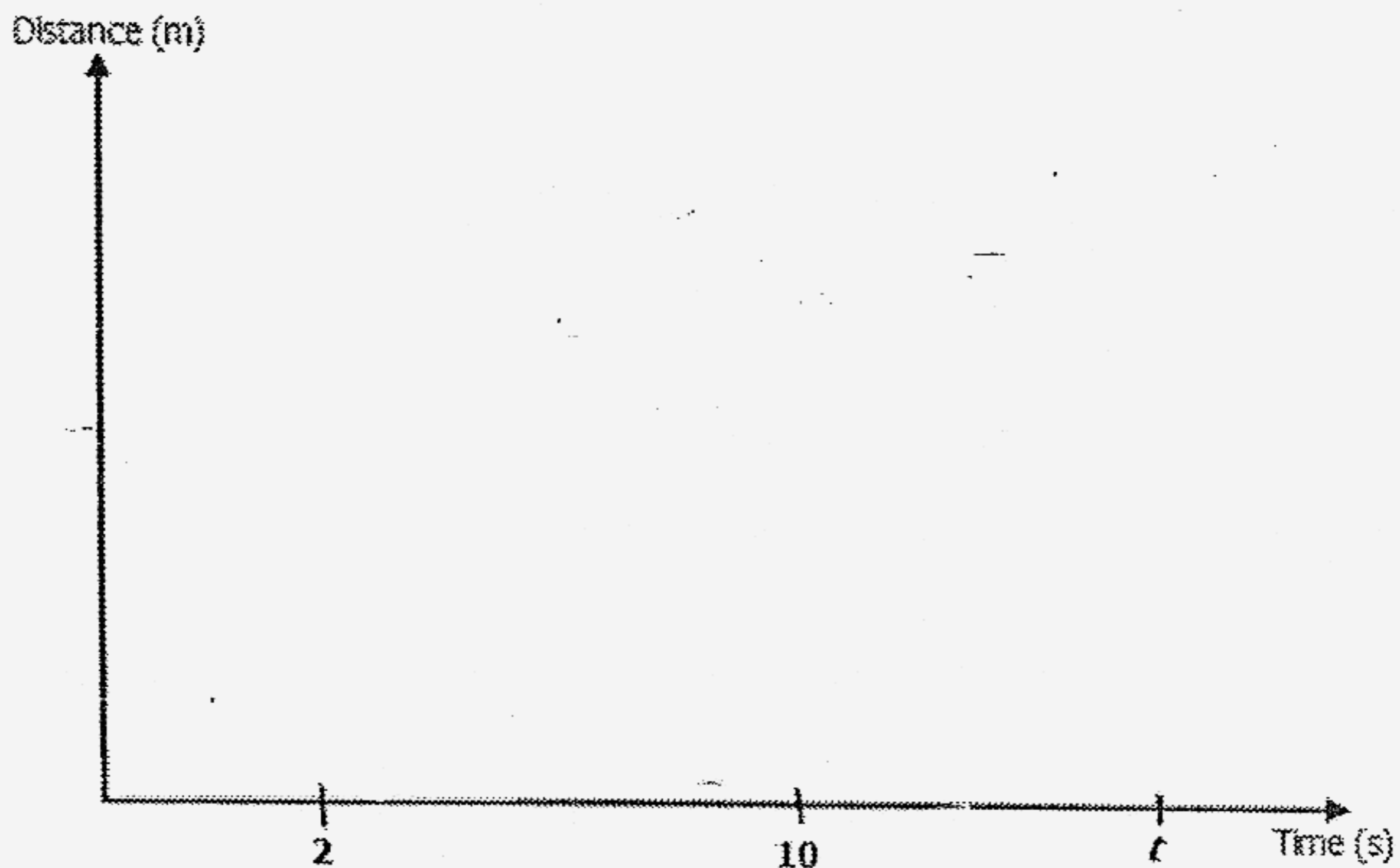
Answer \_\_\_\_\_

1. An outdoor adventure company, "Alliance", rents out tents for campers. For rental of a tent, "Alliance" charges \$35 for the first 7 days plus \$3.50 per day for each extra day.
- a) i) Find the rental charges for 12 days [1]  
 ii) Find the number of days for which the charge is \$91 [2]
- b) A second company, "Everest" also rents out tents. "Everest" charges \$4.20 for each day the tent is rented.  
 When a tent is rented for  $x$  days, "Everest" charges \$21 more than "Alliance".  
 Given that  $x > 7$ , write down an expression in terms of  $x$ , or the number of dollars charged for  $x$  days by  
 i) "Alliance" [1]  
 ii) "Everest" [1]
- Hence, or otherwise, write down and solve an equation of  $x$ . [2]
- c) During a promotion, for a minimum of \$20 spent, "Alliance" is giving their customers a 25% discount while "Everest" is giving a \$10 deduction on the total cost.  
 Find the minimum number of days a person will find it cheaper to rent a tent from "Alliance" than "Everest". [2]
- 2) The points  $A$ ,  $B$  and  $C$  have coordinates  $A(1, 1)$ ,  $B(4, 2)$  and  $C(5, 7)$ . A point  $P$  has coordinates  $P(5.5, 9.5)$ .
- a) Find the gradient of  $BC$ . [2]
- b) Prove that  $B$ ,  $C$  and  $P$  are collinear. [2]
- c) A point  $Q$  lies on the line  $BC$  with coordinates  $(x, 6)$ .  
 Find the value of  $x$ . [2]
- d)  $D$  is a point such that  $ABCD$  is a parallelogram. Find the coordinates of  $D$ . [3]
- e) The line  $y = 7$  is the line of symmetry of  $\triangle ACR$ . Find the coordinates of  $R$ . [1]

- 3) The diagram shows the speed-time graph for a train moving from point  $P$  to point  $Q$ .



- a) Find the speed of the train at time = 1.5s [2]
- b) Given that the magnitude of the deceleration of the train is  $\frac{4}{5}$  that of the rate at which it accelerates, find the value of  $t$ . [2]
- c) A car leaves point  $P$  by the same route as the train 2 seconds later. If the car takes 6 seconds to overtake the train, find the distance the car has travelled for this to happen. [2]
- d) Copy the diagram below and sketch the distance-time graph of the train from point  $P$  to point  $Q$  on the axis. [2]



4) Answer the whole of this question on a sheet of graph paper.

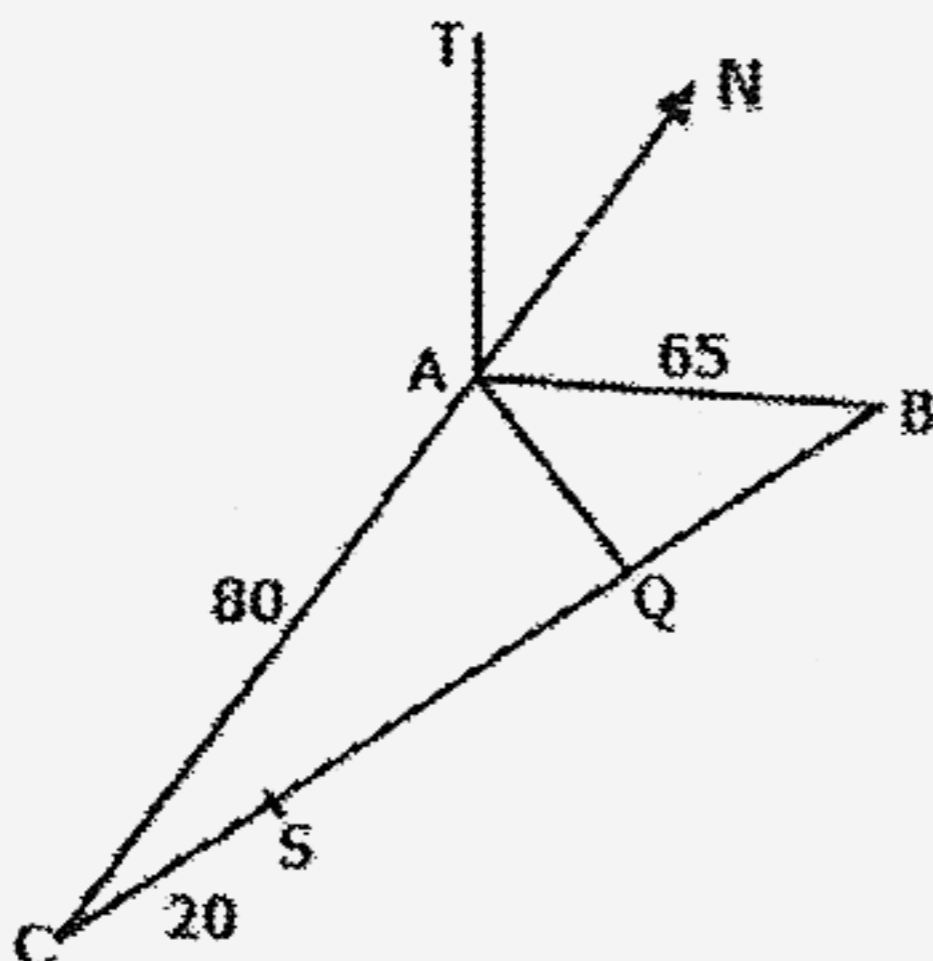
The variable  $x$  and  $y$  are connected by the equation  $y = x^2 + \frac{48}{x} + 3$  and some corresponding values of  $x$  and  $y$  are given in the table below.

X	1	1.5	2	3	3.5	4	4.5	5	5.5	6
Y	52	37.3	31	28	$h$	31	$k$	37.6	42	47

- Calculate the values of  $h$  and  $k$ . [2]
- Taking 2 cm to represent 1 unit on the  $x$ -axis and 2 cm to represent 5 units on the  $y$ -axis, draw the graph of  $y = x^2 + \frac{48}{x} + 3$  for  $1 \leq x \leq 6$ . [3]
- By drawing a suitable straight line, find the  $x$ -coordinate on the curve  $y = x^2 + \frac{48}{x} + 3$  where the gradient is 5. [2]
- From your graph, find the range of values of  $x$  for which  $x^2 + \frac{48}{x} < 32$ . [2]
- By drawing a suitable straight line on your graph, find the values of  $x$ , where  $1 \leq x \leq 6$ , satisfying the equation  $x^3 + 2x^2 + 48 = 45x$ . [3]

5) A, B, and C are points on the level ground such that C is due south of A and B is due east of A. S is a point on BC such that CS = 20 m. Q is the foot of perpendicular from A on BC. Given that AC = 80 m and AB = 65 m. A tower TA of height 20 m stands at A. Calculate

- the bearing of C from B, [2]
- the distance AS, [3]
- the area of  $\triangle ABS$ , [3]
- the angle of elevation of T from Q [3]



## Answers

1(i) 1.34

(ii)  $1.8 \times 10^{-7}$

2(a)  $\frac{-a}{2a+3}$

(b) 4.1375

3(i) (0, 3)

(ii)  $y = \frac{3}{4}x - 3$

4.  $x = -8$

5(a) 14.28

(b) 10

6.  $x = -1, 0, 1, 2$

7(i)(a)  $35^\circ$   
(ii)  $67.5 \text{ cm}^2$

(b)  $55^\circ$

(c)  $125^\circ$

(d)  $20^\circ$

8(i) 17 cm

(ii)  $-\frac{3}{5}$

(iii)  $4\frac{4}{17}$

9(a)  $\frac{1}{8}$

(b) -1

10(i) 132

(ii)(a) 1148.4

(b) 13.2

11(i) 60 cm

(ii)  $2560 \text{ cm}^2$

(iii)  $625000 \text{ cm}^3$

12(i) Radius perpendicular to tangent

(ii)(a)  $65^\circ$

(b)  $335^\circ$

(c)  $130^\circ$

13. 7

Answers

1ai) \$53.50      ii) 23  
Bi)  $35+3.5(x-7)$       ii)  $4.2x$

c) 12

2a) 5      c) 4.8      d) (2,6)      e) (1,13)

3a) 11.23m/s      b) 12.5s      c) 105m

4)  $h = 28.96$ ,  $k = 33.92$

c)  $x=4$       d)  $1.63 < x < 4.65$       e)  $x=1.16$  or  $5.04$

5a)  $219.1^\circ$       b) 65.7m      c)  $2095.6\text{m}^2$       d)  $21.6^\circ$