1. Evaluate
   a) $5^0 + 5^2 \times 5^{-3}$

   b) $\left(\dfrac{16}{250}\right)^{\frac{1}{3}}$

   Answer (a) _____ [1]

   (b) _____ [2]

2. Given that $77 \times 131 = 10087$,
   a) complete the statement
   $$79 \times 131 = 10087 + \ldots$$
   b) write down the exact value of
     i) 0.077×13100
     ii) $0.10087 \div 0.0077$

   Answer (a) _____ [1]

   (bi) _____ [1]

   (bii) _____ [1]

3. a) Expand and simplify $x^2 - (x-7)^2 + 40$.

   bi) Factorise $mn^2 - 4m$ completely.

   ii) Hence evaluate $3 \times 98^2 - 4 \times 3$.

   Answer (a) _____ [2]

   (bi) _____ [2]

   (bii) _____ [1]

4. Solve the simultaneous equations

   $0.5a + 2b = 18$

   $2.5a - b = 13$

   Answer _____ [3]

5. Express the following as a single fraction, simplify your answer as much as possible.

$$\frac{2x-1}{x^2-4x+3} - \frac{x}{3-x}$$

Answer _____ [3]

6. Solve the following equation.

$$3^{x+1} \times (9^x)^2 \div 27^{x+3} = 81$$

Answer _____ [3]

7. Simplify the following.
$$\frac{(x^2)^{-3} \times (xy)^4}{(x^{-1}y)^2}$$

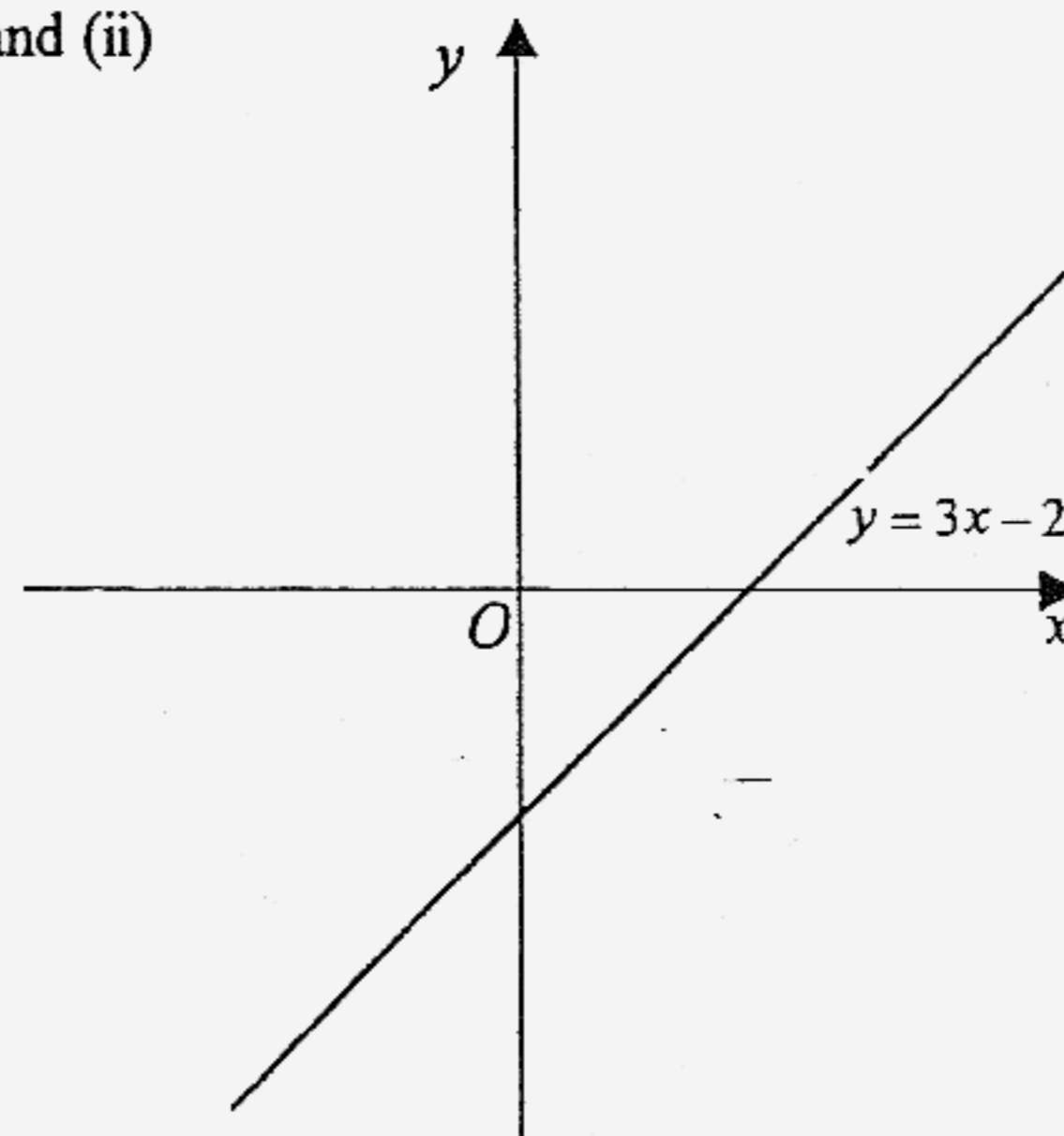*Answer* .... [3]

8. a) The graph of $y = 3x - 2$ is shown in the answer space. On the diagram, **showing the intercepts clearly**, sketch the graphs of
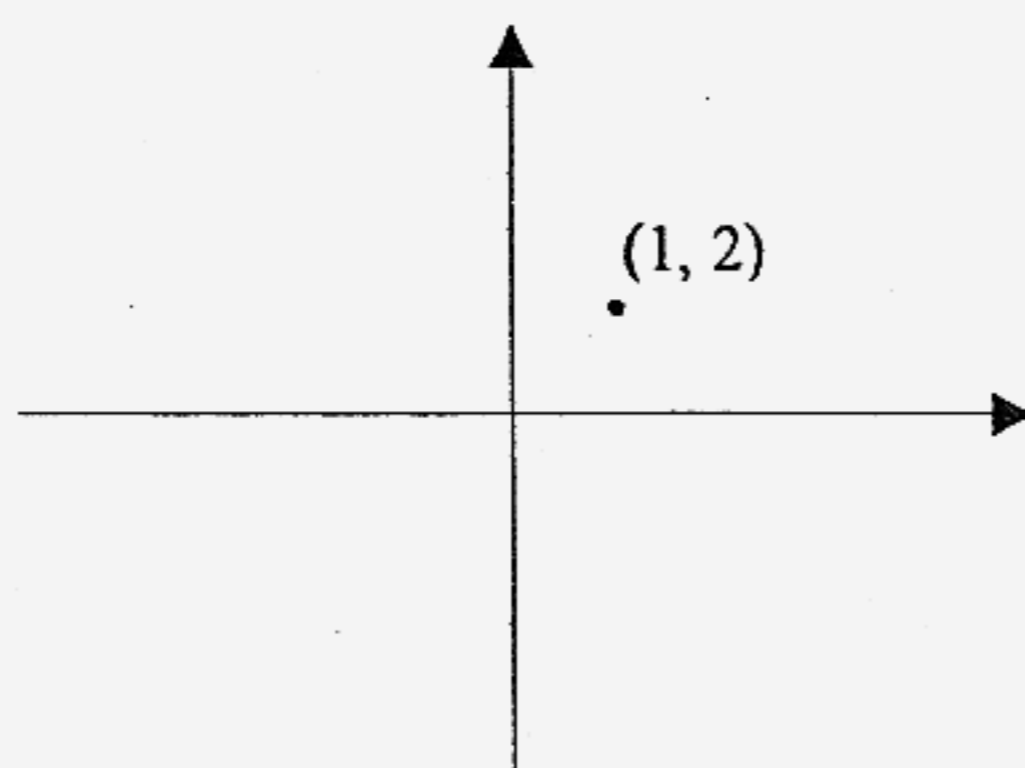
   i) $y = 3x + 2$, [1]

   ii) $y = -3x - 2$. [1]

   Answer (a) (i) and (ii)

   b) Sketch the graph of $y = \dfrac{2}{x}$ [2]

   (1, 2)

9. The volumes of two spheres are in the ratio 125 : 216. If 144 kg of paint was required to paint the outer surface of the larger sphere, then how many kilogrammes of paint would be required to paint the outer surface of the smaller sphere?

Answer _____ kg [3]

10. Solve the following inequality

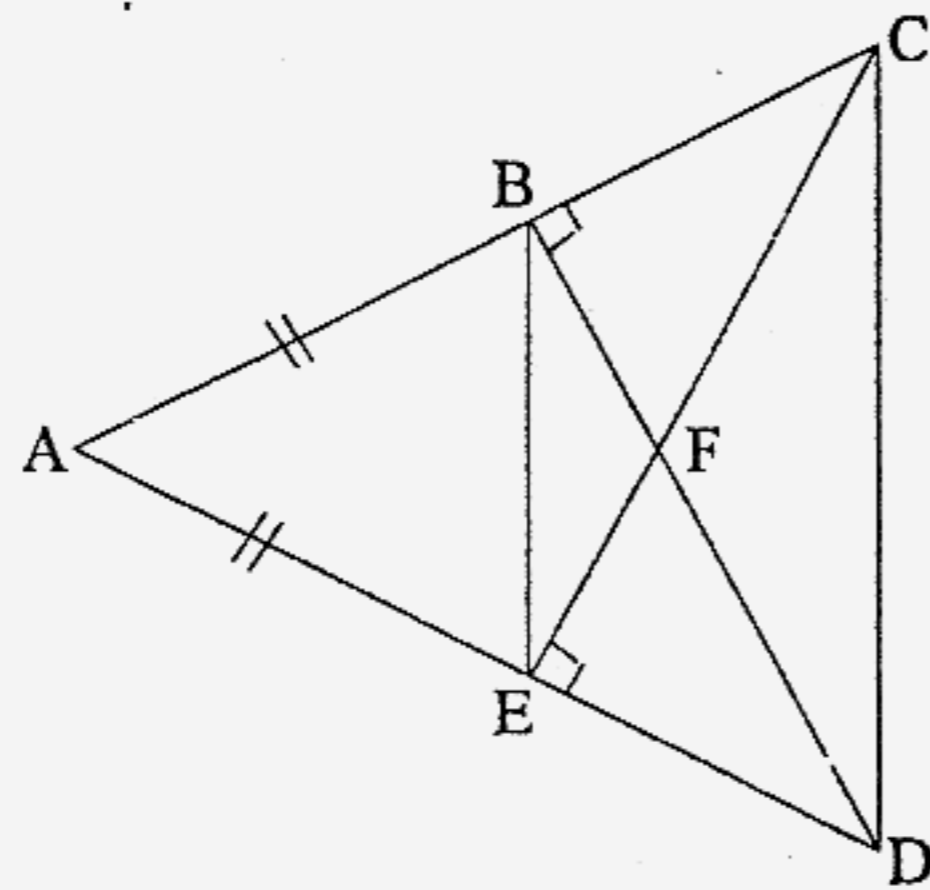$$\frac{1}{2}x+3 < \frac{1}{3}x+5 < x-1$$

Answer _____ [3]

11. Given that x and y are integers and $2 \leq x \leq 5$ and $-8 \leq y \leq -3$, find

a) the least possible value of $x^2 + y^2$

b) the greatest possible values of $(x - 2y)^2$

Answer (a) ....   [1]

(b) .... [1]

12.

In the figure, AB = AE.

Name a triangle in the figure which is congruent to   ABD. Explain why they are congruent.

Answer

....

....

....

.... [3]
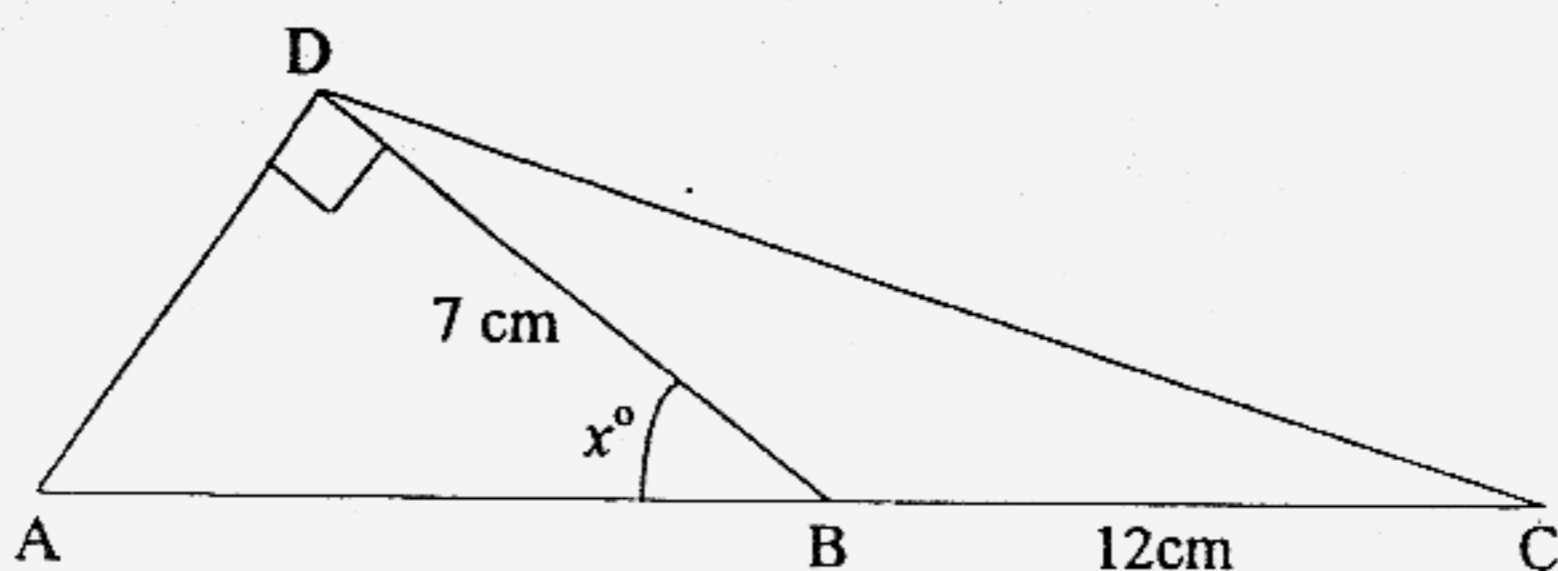
13.

In the diagram, ABC is a straight line, BC = 12 cm, BD = 7 cm and ∠ADB is a right angle. Using as much information given in the table below as necessary,

	sin	cos	tan
x^o	0.6	0.8	0.75

Calculate   **(a)**   AD,

             (b)   cos ∠DBC

             (c)   the area of triangle DBC.

Answer (a) _____ cm   [2]

         (b) _____ [1]

         (c) _____ cm^2 [2]

14. The diagram is the speed-time graph of a car.
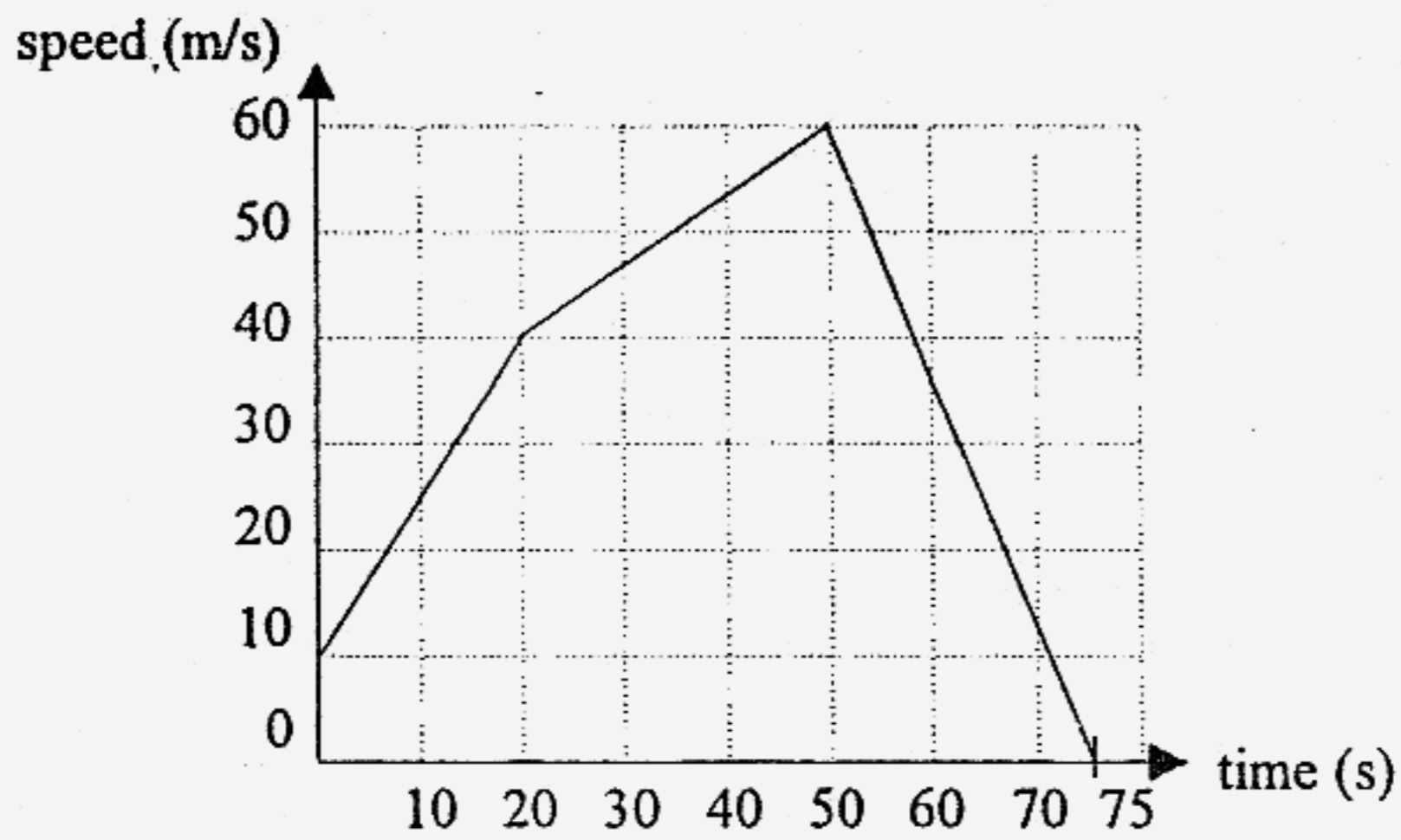
(a) Calculate the acceleration of the car during the first 20 seconds.
(b) Calculate the distance travelled by the car during the first 50 seconds.
(c) Calculate the speed of the car at time = 60 seconds.
(d) On the axes in the answer space, sketch the acceleration time graph for the first 75 seconds of the motion of the car.
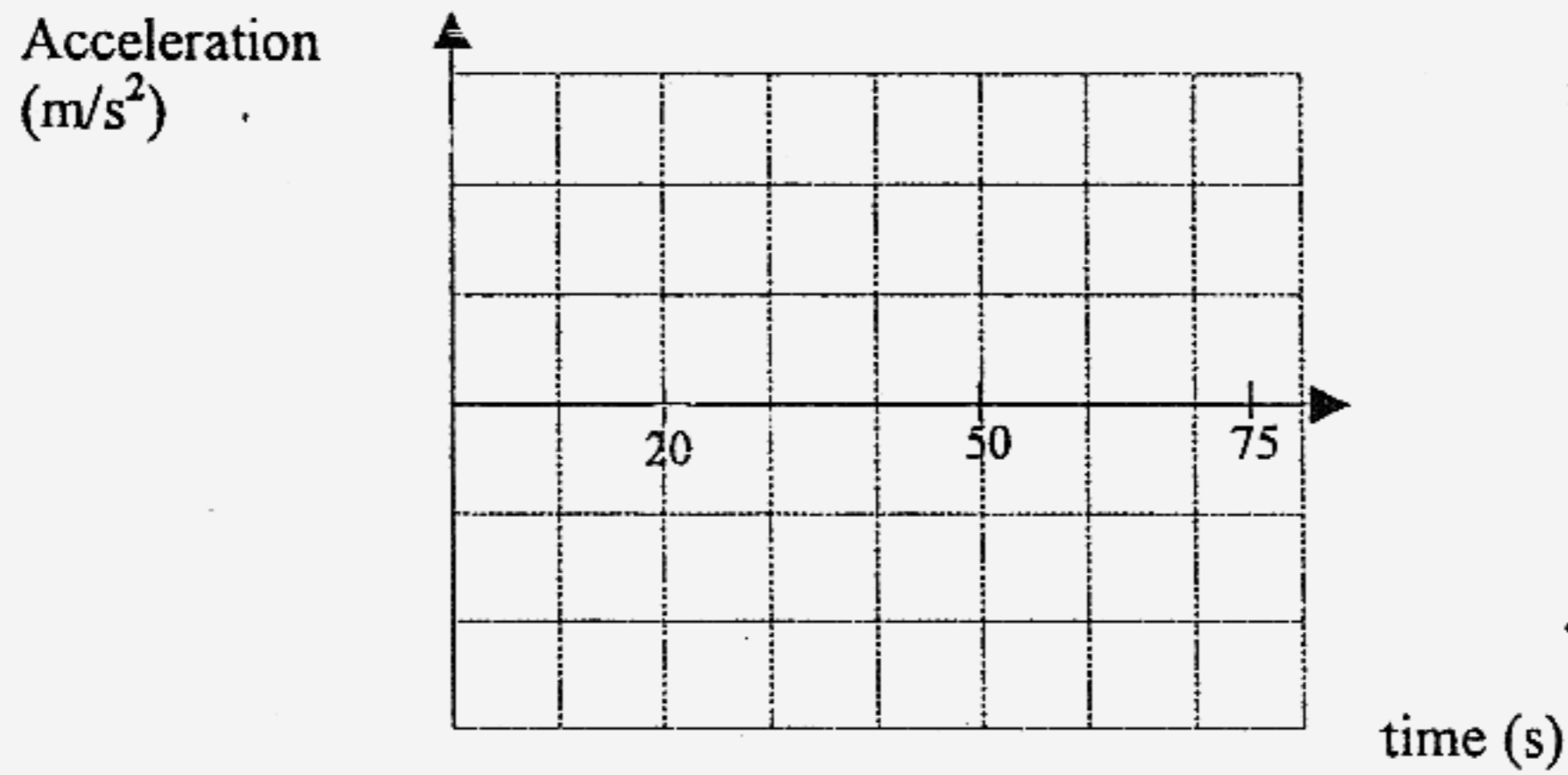
[2]

Answer (a) _____ m/s^2 [1]

(b) _____ m [2]

(c) _____ m/s [2]

End of paper

Section A

Answer all the questions

1a) Solve the equation $2r^2 - 7r - 3 = 0$, leaving your answers to 2 decimal
places. [2]

b) Simplify $\dfrac{x^2 + 2xy}{x+y} \div \dfrac{x^2 + xy - 2y^2}{x-y}$ [2]

c) If $\dfrac{1}{x+12} + \dfrac{1}{x-12} = \dfrac{y}{x^2 - 144}$, express y in terms of x. [2]

2) P, Q and O are points with coordinates (2, 4), (6, 7) and (0, 0) respectively.

(a) Find the equation of a line which passes through (8, 5) and is parallel to PQ. [2]

(b) A point, W on the y axis is equidistant from P and Q. Find the coordinates
of point W. [2]

(c) The point A is such that the line $x = 2$ is the line of symmetry of $\triangle OPA$. Find the
coordinates of A. [1]

(d) Given that OPQR are vertices of a parallelogram, find the coordinates of R. [2]

3)
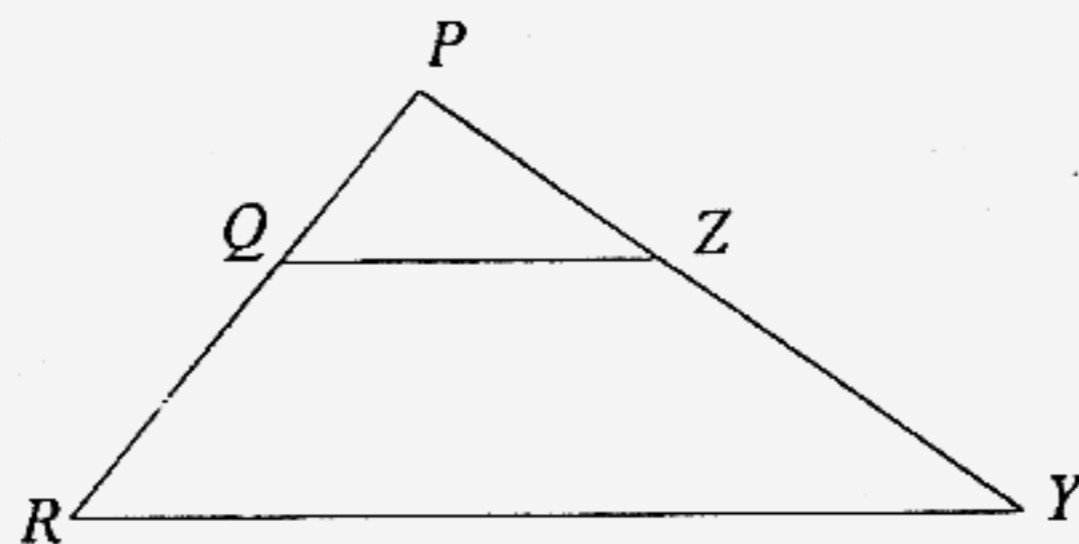
In the diagram, QZ is parallel to RY, $PQ = 3$ cm, $QR = 6$ cm, $PZ = 4$ cm and $PY = 12$ cm.

(a) Show that $\triangle PQZ$ is similar to $\triangle PRY$. [2]

(b) Find the numerical value of $\dfrac{\text{area of } \triangle PQZ}{\text{area of trapezium } QZYR}$ [1]
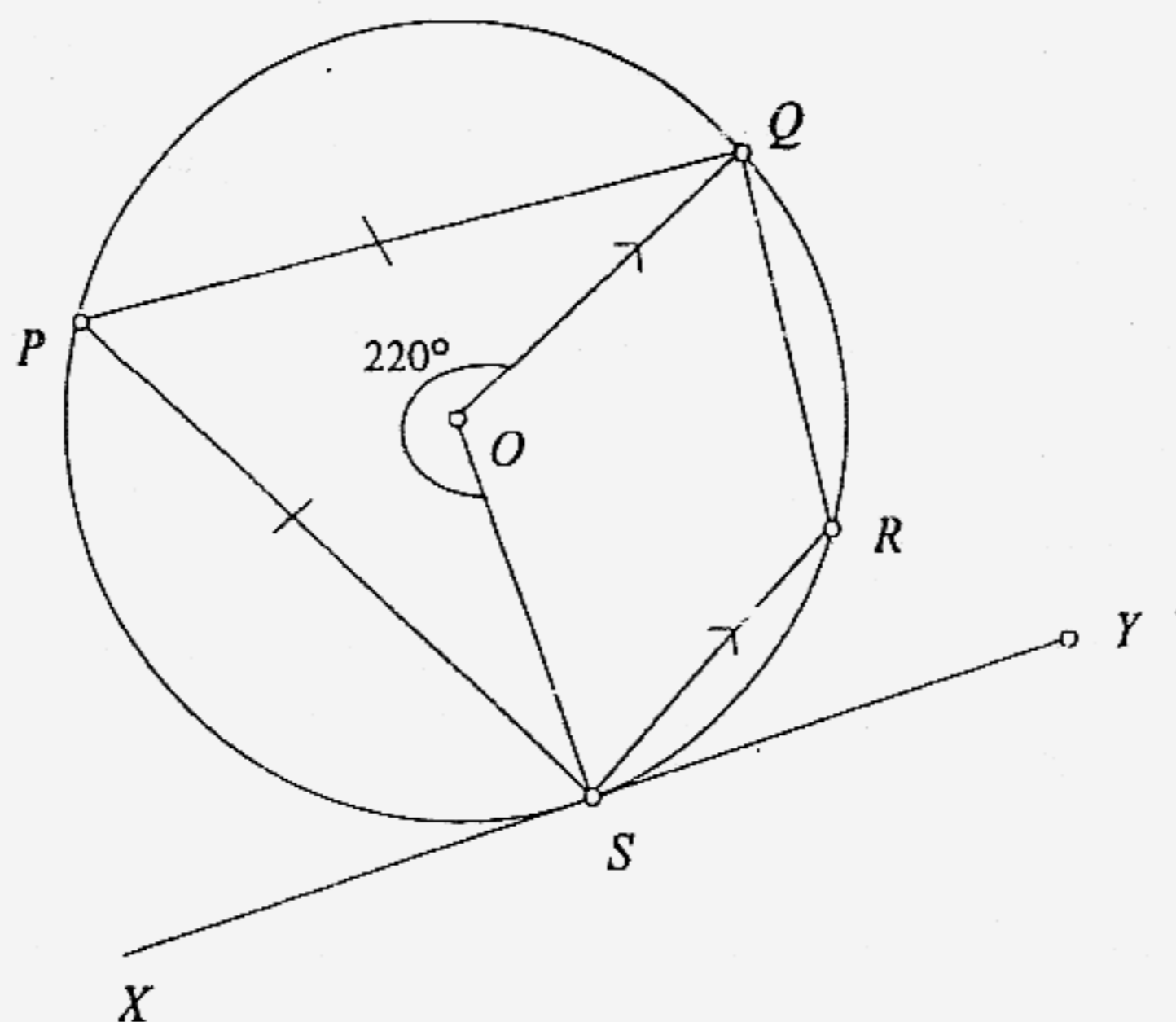
(c) S is on PR produced and X is on PY produced such that $\dfrac{PR}{PS} = \dfrac{PY}{PX} = \dfrac{1}{3}$.

Find i) the length of PS [2]

ii) Find the numerical value of $\dfrac{\text{area of } \triangle PQZ}{\text{area of } \triangle PSX}$. [2]

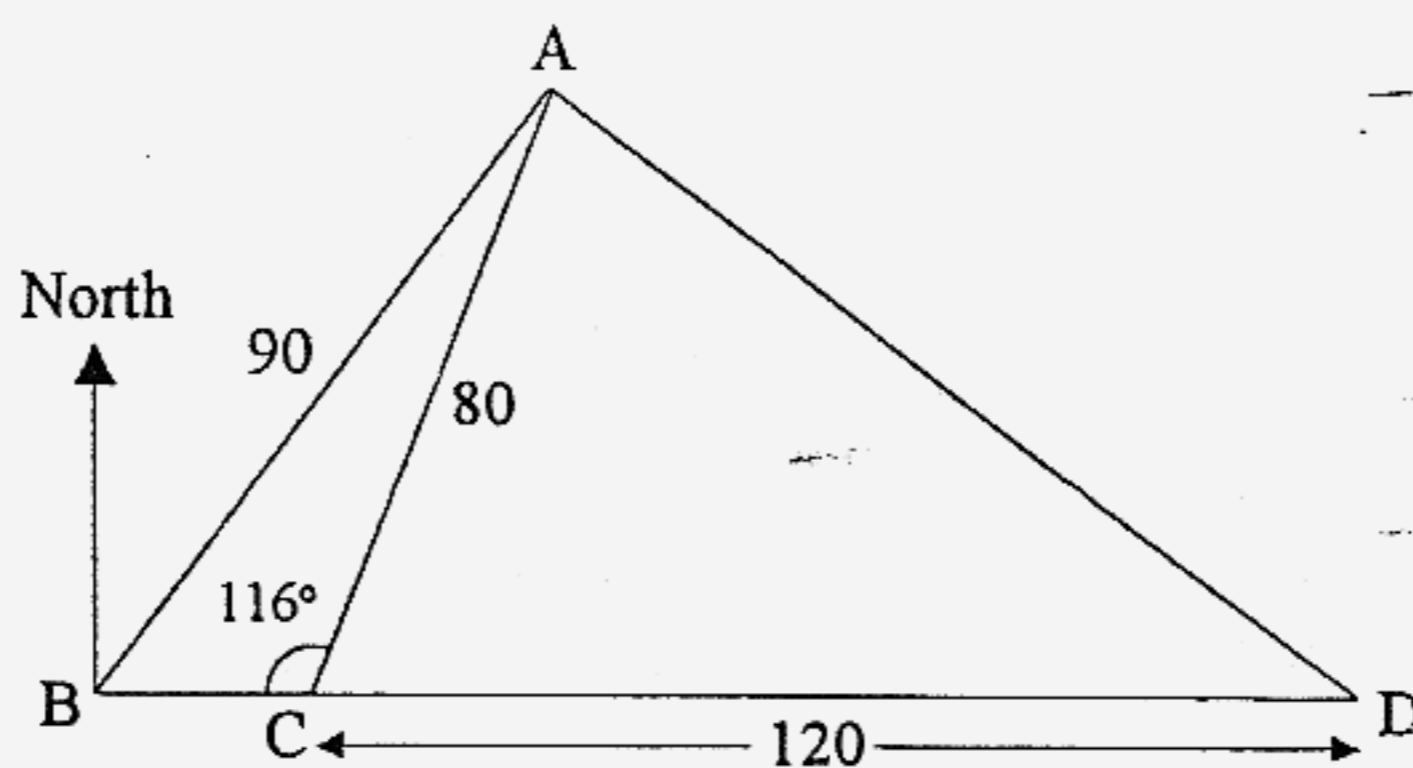(d) If the area of $\triangle PQZ$ is 6 cm^2, find the area of trapezium $RSXY$. [3]

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4

In the diagram above, *PQRS* are points on the circumference of a circle, whose centre is *O*. Given that *OQ* is parallel to *SR*, *PS* = *PQ*, reflex $Q\hat{O}S$ = 220° and *XY* is the tangent to the circle at *S*.

Calculate

a) $Q\hat{P}S$, [2]

b) $P\hat{S}Q$, [1]

c) $O\hat{S}P$, [2]

d) $R\hat{S}Y$, [2]

e) $P\hat{Q}R$. [1]

5.

In the diagram above, D is east of B and BCD is a straight line.
AB = 90 m, AC = 80 m, CD = 120 m and $\angle BCA = 116°$.
Calculate
a) $\angle BAC$ [3]
b) the bearing of B from A [2]
c) AD [2]
d) the shortest distance from A to CD. [2]

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Section B

Answer either Question 6 or 7

Question 6 (Answer the whole of this question on a sheet of graph paper.)

The variables x and y are connected by the equation $y = x + \dfrac{4}{x} - 5\dfrac{1}{5}$.

x	0.5	0.7	1.0	1.5	2.0	3.0	4.0	5.0	7.0	7.5
y	3.31	1.21	−0.20	−1.03	h	−0.87	−0.20	0.60	2.37	k

(a) Calculate the value of h and of k. [1]

(b) Using a scale of 2 cm to represent 1 unit on each axis, draw the graph of
$y = x + \dfrac{4}{x} - 5\dfrac{1}{5}$ for the range $0.5 \le x \le 7.5$. [3]

(c) Use the graph to estimate the solution of the equation $x + \dfrac{4}{x} = 5\dfrac{1}{5}$. [1]

(d) By drawing a tangent, estimate the coordinates of the point A on the curve where the gradient of the curve is -1. [2]

(e) By drawing a suitable straight line on the graph, find the range of values of x for which
$$\dfrac{4}{3}x + \dfrac{4}{x} < 7\dfrac{1}{5}$$ [3]

Question 7 (Answer the whole of this question on a sheet of graph paper.)

The variables x and y are connected by the equation $y = 3x + \dfrac{60}{x} - 35$.

x	1.5	2	2.5	3	4	5	6	7	8
y	9.5	p	- 3.5	- 6	-8	-8	- 7	q	- 3.5

(a) Calculate the value of p and q. [1]

(b) Using a scale of 2 cm to represent 1 unit on the x-axis, and 1 cm to represent 1 unit on the y-axis, draw the graph of $y = 3x + \dfrac{60}{x} - 35$ for $1.5 \le x \le 8$. [3]

(c) Use the graph to estimate the least value of y. [1]

(d) Use the graph to estimate the values of x when $15x + \dfrac{300}{x} - 145 = 0$, and hence form the quadratic equation that has these 2 values as its solutions. [3]

(d) By drawing a tangent, calculate the gradient of the curve at (3, -6) [2]

End of paper

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Answers

Paper 1

1a) 1.2	b) 0.4	
2a) 262	b) 1008.7	c) 13.1
3a) $14x - 9$	b) $m(n+2)(n-2)$	c) 28800
4) $a = 8$, $b = 7$		

5) $\dfrac{x^2 + x - 1}{(x-3)(x-1)}$

6) $x = 6$

7) y^2

9) 100kg

10) $9 < x < 12$

11a) 13	b) 441	
12) Triangle AEC		
13a) 5.25 cm	b) -0.8	c) 25.2 cm^2
14a) 1.5m/s^2	b) 2000m	c) 36m/s

Paper 2

1a) 3.89 or -0.39   b) $\dfrac{x}{x+y}$ c) $y = 2x$

2a) $y = \dfrac{3}{4}x - 1$ b) $w\left(0, 10\dfrac{5}{6}\right)$ c) A(4, 0)   d) R(4, 3)

3b) $\dfrac{8}{9}$ ci) PS = 27 cm   ii) $\dfrac{1}{81}$ d) 432 cm^2

4a) 70	b) 55	c) 35	d) 50	e) 105
5a) 11.0	b) 217.0	c) 111m	d) 71.9 m	
6a) h = -1.2, k = 2.83	c) x = 0.95 or 4.2	d) A(1.5, - 1.03)		

e) $0.6 \le x < 4.75$

7a) p = 1, q = -5.4   c) -8.3   d) x = 3 or 6.67; $(x - 3)(x - 6.67) = 0$

e) -3