

AP2_CTHS_2000

Question 1

- a) Solve $|x - 3| = 2x + 1$ 2
- b) Solve and graph on the number line $\frac{t^2 + 4}{t} \geq 2t$ 3
- c) The point R divides the interval PQ externally in the ratio 3 : 2. If P is (1,5) and Q(6,20):
(i) find R 3
(ii) In what ratio does Q divide PR?
- d) Find the acute angle between the lines $2x + 3y - 1 = 0$ and $x + y - 4 = 0$ to the nearest degree. 2
- e) Expand and simplify $(2 + 3x)^4$ 2

Question 2

- a) Find the coordinates of the point where the normal to the curve $y = 3x^2 + x - 1$ at (1,3) cuts the x-axis. 3
- b) Determine the value of the constant a if the tangent to the curve $y = \frac{a}{x+1}$ has a gradient of $-\frac{1}{2}$ when $x = 1$. 2
- c) Write the coordinates of the vertex, focus, directrix and axis of symmetry of $(x-3)^2 = 24(y-1)$. 4
- d) Find the equation of the locus of the point P(x,y) which moves in such a way that its distance from the point A(-2,-2) is twice its distance from the point B(1, -1). Describe this locus geometrically. 3

Question 3

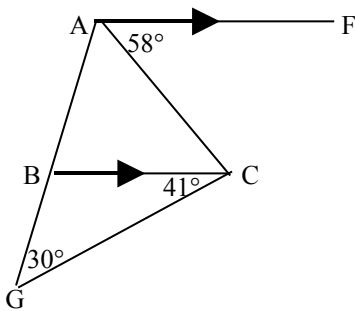
- a) Simplify $\frac{\sin(90 - x^\circ)}{\cos(180 - x^\circ)}$ 1
- b) Solve $2\sin^2x - \sin x = 0$ for $0^\circ \leq x \leq 360^\circ$ 2
- c) Prove that $\tan A \sin A + \cos A = \sec A$ 3
- d) A ship is 3500 due south of a lighthouse and travelling on a bearing of 325° . What is the closest distance the ship comes to the lighthouse to the nearest metre? 2
- e) The elevation of a hill from a place P due east of it is 47° , and at a place Q due south of P the elevation is 33° . If the distance from P to Q is 400m, find the height of the hill to the nearest metre. 4

Question 4

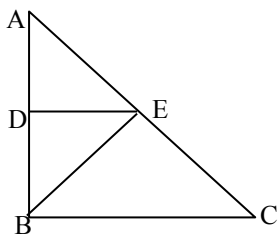
- a) For what values of k does the equation $x - \frac{k}{4x} = k+2$ have real roots? 4
- b) Solve $x^4 + x^2 - 12 = 0$. 3
- c) If $x^2 - 4 = A(x+1)(x-2) + Bx + C$. Find A, B and C. 3
- d) Show that $12 + 4x - x^2$ can never be greater than 16 for all real values of x . 2
- e) For what values of k will the equation $x^2 - (k+4)x + (7+k) = 0$ have one root as the reciprocal of the other?

Question 5

- a) Find $\angle BAC$ with reasons: 2

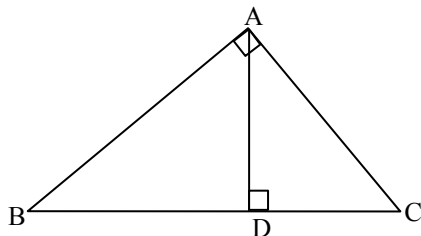


- b) Triangle ABC has a right angle at B. D is the midpoint of AB. E lies on AC, DE is parallel to BC. 5



- (i) Prove triangle AED is congruent to triangle BED.
(ii) Prove $BE = EC$

- c) Prove triangle ABD is similar to triangle ADC. 3



- d) If the interior angle of a rectangular polygon is k times as large as its exterior angles. Prove that the polygons has $2(k+1)$ sides. 3

1. a) $x = \frac{2}{3}$

b) $t \leq -2$ or $0 < t \leq 2$

c) (i) (16, 50)

(ii) 1 : 2

d) 79°

e) $16 + 96x + 216x^2 + 216x^3 + 81x^4$

2. (a) (22, 0)

b) $a = 2$

c) V: (3,1)

F: (3, 7)

D: $y = -5$

Axis $x = 3$

d) $(x-2)^2 + (y+2)^2 = 8$

Centre of the circle (2, -2)

And radius $\sqrt{8}$

3. a) -1

b) $x = 0^\circ, 30^\circ, 150^\circ, 180^\circ, 360^\circ$

d) 2008m

e) 326m

4. a) $k \leq -4$ or $k \geq -1$

b) $x = \pm 2$

c) $A = 1, B = 1$ and $C = -2$

d) 16

e) $k = -6$

5. a) 51°

