1. The point A is (-6, 4) and B is (5, 1). Find the coordinates of the point which divides AB internally in the ratio 3:4.

[A] (-39, 13) [B] $(\frac{12}{-7}, \frac{23}{7})$ [C] $(\frac{-9}{7}, \frac{19}{7})$ [D] $(\frac{2}{7}, \frac{16}{7})$

2. What is the remainder when the polynomial P(x) =$5x^3$ -$17x^2$ – x + 11 is divided by (x – 2)?

[A] -147 [B] -19 [C] -95 [D] 11

3. In a class of thirty girls, 13 are dancers and 23 are gymnasts. If seven girls do both dance and gymnastics, what is the probability that a girl chosen at random does neither dance nor gymnastics?

[A] $\frac{1}{3}$ [B] $\frac{7}{30}$ [C] $\frac{1}{30}$ [D] $\frac{8}{15}$

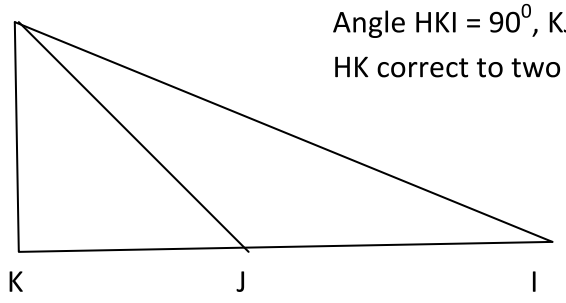
4. The quadratic equation $3x^2 - x - 4 = 0$ has roots α and β. What is the value of $\alpha^2 + \beta^2$?

[A] $\frac{-23}{9}$ [B] $\frac{13}{9}$ [C] $\frac{19}{9}$ [D] $\frac{25}{9}$

5. Simplify: $\frac{25^{2x}}{5^x}$

[A] 5^2 [B] 5^x [C] 5^{2x} [D] 5^{3x}

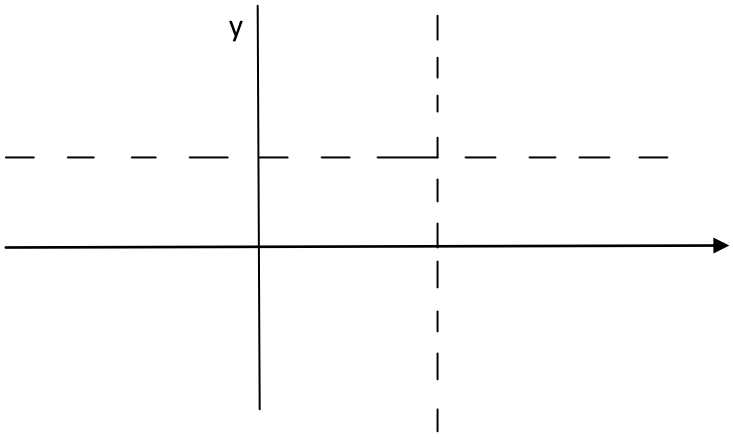
6. H



Angle HKI = 90^0, KJI is a straight line. If JI = 16cm, find the length of HK correct to two decimal places.

[A] 8.00cm [B] 11.07cm [C] 11.52cm [D] 55.80cm

7. Part of the function $y = \frac{a}{x+b} + c$ is shown below:



The value of *a*, *b* and *c* respectively are:

[A] 2, 3, 2 [B] 2, -3, 2 [C] -2, -3, 2 [D] -2, 3, 2

8. If $3\sqrt{5} + \sqrt{20} = \sqrt{a}$ then *a* has a value of:

[A] 5 [B] 25 [C] 125 [D] 15

9. Given that $\sin A = \frac{20}{29}$ and $90^0 \leq A \leq 180^0$, what is the exact value of $\cos A$?

[A] $\frac{21}{29}$ [B] $\frac{-21}{29}$ [C] $\frac{21}{20}$ [D] $\frac{-21}{20}$

10. What is the value of $\sqrt{\frac{a^2+b^2}{c^2}}$ if *a* = 1.23, *b* = 0.859 and *c* = 4.815? Answer correct to three significant figures.

[A] 0.312 [B] 1.243 [C] 0.0647 [D] 0.434

Question 11 (20 marks) — marks

(a) Express $\frac{2\sqrt{5}}{\sqrt{2}-\sqrt{5}}$ with a rational denominator. **2**

(b) Simplify : (i) $\log_3 12 + \log_3 6 - 3\log_3 2$ **2**

(ii) $\log_4 \sqrt[3]{4096}$ **2**

(c) The probability that Helena can solve a maths problem is 0.75; the probability that Esther can solve the same problem is 0.65. Find the probability that:

(i) Both girls can solve the problem. **1**

(ii) At least one of the girls solves the problem. **1**

(d) Victor's marks in the recent exams are listed in the table below:

Subject	mark	mean	S.D.
Science	83	70	5
History	72	70	0.5

In which exam did Victor perform better? Explain why. **2**

(e) The scores from a test marked out of 10, are shown in the table below:

x	*f*
2	1
3	0
4	3
5	6
6	5
7	8
8	7
9	4

(i) Calculate the median for this set of scores **1**

(ii) Calculate the Interquartile Range **2**

(iii) Construct a box and whisker plot based on this data. **2**

(f) The volume (Vm^3) of a series of silos is given by $V = kh^3$, where $k = 0.6$ and h is the height of the silo in metres.

(i) Mr Grant wants to install a silo with a volume of $3m^3$ on his farm. How high will this silo be? Answer correct to two decimal places. **1**

(ii) If Mr Grant doubled the height of his silo, would the volume be doubled? Justify your answer. **2**

(g) Prove that $\log_{na} x = \frac{\log_a x}{1+\log_a n}$ **2**

<u>Question 12 (20 marks)</u> **Start a new page** **marks**

(a) For f(x) = $\begin{matrix} x+1 \\ x^2+2x-1 \\ 3^x \end{matrix}$ $\begin{matrix} x \geq 3 \\ -1 \leq x \leq 3 \\ x \leq -1 \end{matrix}$ find the value of f(2) + f(-2) – f(6). **2**

(b) Graph neatly on ***separate*** number planes, clearly showing all important features:

(i) $y = 2^{x-1}$ **2**

(ii) $x^2 + (y-1)^2 = 4$ **2**

(iii) $2x + 3y - 9 < 0$ **2**

(c) Find the points of intersection of the graphs $y = x^3$ and $y = 2x^2 - x$. **3**

(d) (i) Find the centre and the radius of the circle $x^2 - 6x + y^2 + 12y + 8 = 0$. **3**

(ii) For what exact value/s of b is $y = 3x + b$ a tangent to the circle in (d)(i)? **2**

(e) (i) Graph neatly $y = \frac{2}{3-x}$ clearly showing all important features. **2**

(ii) Hence or otherwise solve $\frac{2}{3-x} < 1$. **2**

Question 13 (20 marks) **Start a new page** **Marks**

(a) Let α, β and γ be the roots of the equation $x^3 - 3x^2 - 6x - 1 = 0$. Find the value of:

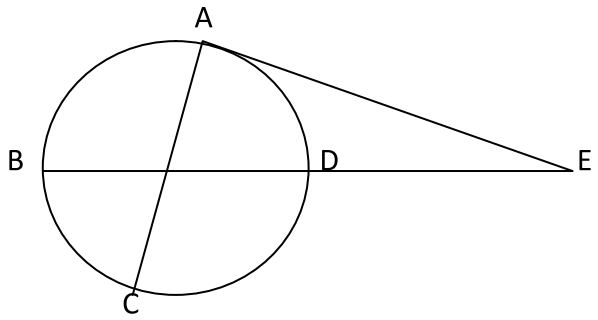
(i) $2\alpha + 2\beta + 2\gamma$ **1**

(ii) $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma}$ **2**

(iii) $(\alpha - 1)(\beta - 1)(\gamma - 1)$ **2**

(b) Sketch neatly $y = \frac{1}{2}(x + 1)(x - 2)^2$ clearly showing all intercepts. **2**

(c) AC and BD are diameters of the circle. AE is a tangent to the circle at A. AC and BD intersect at O, the circle's centre.



Copy the diagram neatly onto your answer page and prove that ∠OBC = ∠AED + ∠BAO. **4**

(d) Solve for $0^0 \leq \theta \leq 360^0$:

(i) $\cos\theta = 0$ **1**

(ii) $sin^2\theta = \frac{3}{4}$ **2**

(iii) $sin^2\theta + sin\theta cos\theta - 6cos^2\theta = 0.$ **3**

(e) Prove that $(sec\theta - 2tan\theta)^2 - (2sec\theta - tan\theta)^2 = -3.$ **3**

Question 14 (20 marks) **Start a new page** **Marks**

(a) If $\tan\theta = \frac{7}{8}$ and $\cos\theta < 0$, find the exact value of $\sin\theta$. **2**

(b) Solve for *x*: $9^{2x-3} = \frac{1}{27}$ **2**

(c)

(i) Find the perpendicular distance from A(-3, 2) to $y = 5x - 1$. **2**

(ii) B and C are the intercepts $y = 5x - 1$ makes with the coordinate axes, find the area of Δ ABC. **3**

(d) ABCD is a parallelogram. P lies on DC such that DP = PC. BP produced meets AD produced at Q.

(i) Draw neatly a diagram, clearly showing all of the above information. **1**

(ii) Prove that ΔDPQ Ξ ΔCPB. **3**

(iii) Hence or otherwise show that BP = PQ. **1**

(e) Cameron and Joshua are pilots of two light planes which leave James Ruse Airport at the same time. Cameron flies on a bearing of 330^0T at a speed of 180km/h and Joshua flies on a bearing of 080^0T at a speed of 240km/hr.

(i) Draw a neat diagram clearly showing all of the given information. **2**

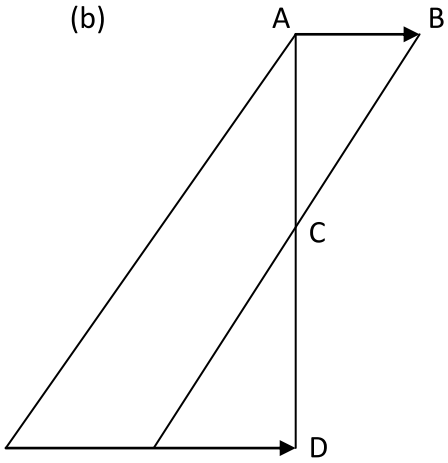
(ii) How far apart are Cameron and Joshua after 2 hours? (answer to 2 dp). **2**

(iii) What is the bearing of Joshua from Cameron after two hours? (to the nearest degree). **2**

Question 15 (20 marks) **Start a new page** **Marks**

(a) Given that $2\log_{10}(x^2\,y) = 3 + \log_{10} x - \log_{10} y$, express *y* in terms of *x*. **3**

(b)



AB//FD, C is the midpoint of AD, E is the midpoint of FD.

* **Copy** the diagram neatly onto your answer paper.

(i) Prove that Δ CDE Ξ Δ CAB. **3**

(ii) Show that AF = 2BC **4**

(c) Solve $\frac{4}{x} = x - 1$ leaving your answer in exact form. **2**

(d) A die is tossed twice. What is the probability that the second number is less than the first? **2**

(e) Given the following equations:

$\frac{1}{x} + \frac{1}{y} = 1 \qquad x + y = g \qquad \frac{y}{x} = h$

Where g ≠ 0; obtain a relationship between *g* and *h* in simplest form; (without *x*'s and *y*'s). **3**

(f) A black jar contains 3 green marbles and P pink marbles, where $P > 1$. Jaime-Leigh takes two marbles out simultaneously. If the probability that they are both the same colour is a half, find all possible values of P. **3**

END OF PAPER