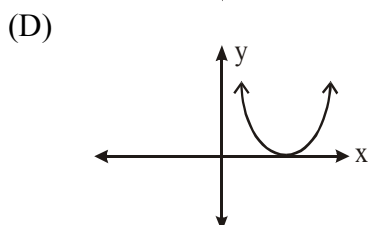
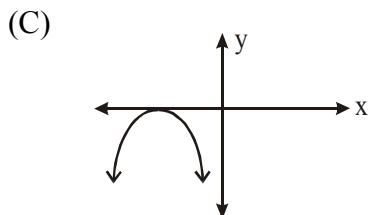
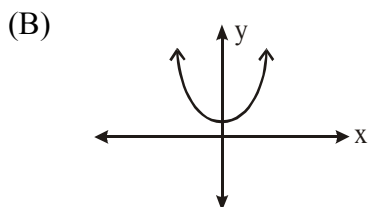
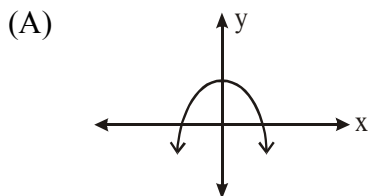


PART I
Total Value: 50%

Answer all items. Shade the letter of the correct answer on the computer scorable answer sheet. All items on Part I have a value of 1 point.

1. The roots of which quadratic equation have a sum of -4 and a product of $\frac{1}{2}$?
- (A) $2x^2 - 8x + 1 = 0$
(B) $2x^2 - 8x - 1 = 0$
(C) $2x^2 + 8x - 1 = 0$
(D) $2x^2 + 8x + 1 = 0$
2. What is the range of the function $y = -2(x+1)^2 + 5$?
- (A) $\{y | y \leq -5, y \in \mathbb{R}\}$
(B) $\{y | y \geq -5, y \in \mathbb{R}\}$
(C) $\{y | y \leq 5, y \in \mathbb{R}\}$
(D) $\{y | y \geq 5, y \in \mathbb{R}\}$
3. A quadratic function $f(x)$ has vertex $(-12, 0)$. What is the nature of the roots of the equation $f(x) = 0$?
- (A) two equal imaginary roots
(B) two equal real roots
(C) two unequal imaginary roots
(D) two unequal real roots
4. Which graph represents a function $f(x)$ where $f(x) = 0$ has $\pm i$ as its roots?



5. Which function describes a reflection in the x -axis, a vertical stretch of 2 and a horizontal translation of 5 units to the left of the graph of $y = x^2$?
- (A) $-\frac{1}{2}y = (x + 5)^2$
 (B) $-(y - 2) = (x + 5)^2$
 (C) $-\frac{1}{2}y = (x - 5)^2$
 (D) $-\frac{1}{2}(y + 5) = x^2$
6. The path of a volleyball is given by $h = -\frac{1}{2}t^2 + 5t + 2$, where t is time in seconds and h is height in metres. At what time, in seconds, does the ball reach its maximum height?
- (A) 2
 (B) 5
 (C) 10.4
 (D) 14.5
7. Which quadratic equation has roots $(2 + \sqrt{5})$ and $(2 - \sqrt{5})$?
- (A) $x^2 - 4x - 21 = 0$
 (B) $x^2 + 4x - 21 = 0$
 (C) $x^2 + 4x - 1 = 0$
 (D) $x^2 - 4x - 1 = 0$
8. What is $y = -2x^2 + 8x - 5$ in standard form?
- (A) $y = -2(x - 2)^2 - 13$
 (B) $y = -2(x - 2)^2 - 9$
 (C) $y = -2(x - 2)^2 + 3$
 (D) $y = 2(x + 2)^2 + 3$
9. If $\frac{2}{5}x^2 - 7x$ is written in the form $a(x - h)^2 + k$, what is the value of h ?
- (A) $\frac{7}{2}$
 (B) $\frac{35}{4}$
 (C) $\frac{49}{4}$
 (D) $\frac{35}{2}$
10. Which quadratic function has vertex $(4, 10)$ and passes through $(6, -2)$?
- (A) $-\frac{8}{3}(y - 4) = (x - 10)^2$
 (B) $-\frac{3}{8}(y - 4) = (x - 10)^2$
 (C) $-\frac{1}{3}(y - 10) = (x - 4)^2$
 (D) $\frac{1}{3}(y - 10) = (x - 4)^2$

11. Solve for x : $5x^2 - 1 = \sqrt{5}x$?

- (A) $\frac{\sqrt{5} \pm 3\sqrt{3}}{10}$
 (B) $\frac{\sqrt{5} \pm 5}{10}$
 (C) $\frac{-\sqrt{5} \pm 5}{10}$
 (D) $\frac{\sqrt{5} \pm i\sqrt{15}}{10}$

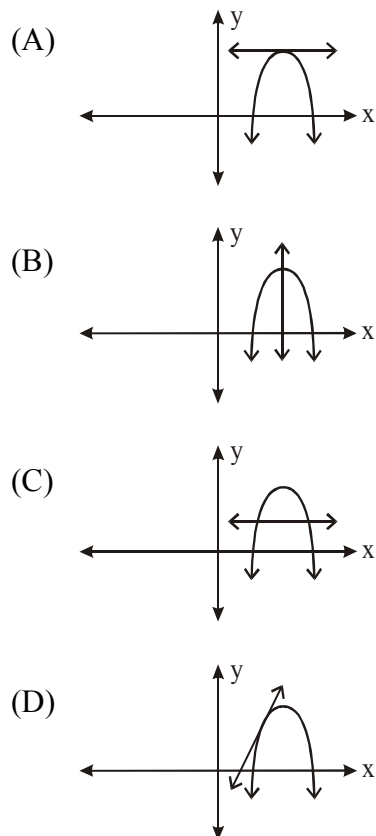
12. What are all possible value(s) of 'b' if $2x^2 + bx = -8$ has a discriminant of -15 ?

- (A) $\pm i\sqrt{79}$
 (B) ± 7
 (C) 7
 (D) 49

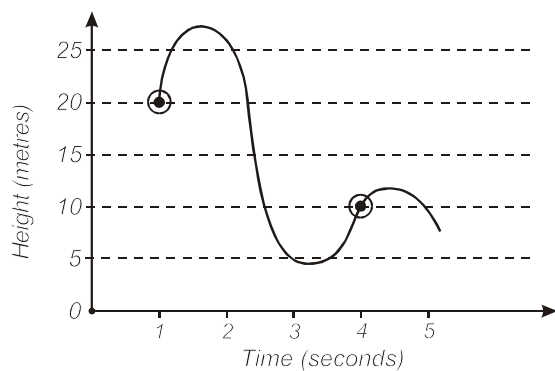
13. If the common difference between successive terms in the sequence generated by $t_n = an^3 + bn^2 + cn + d$ is 12, what is the value of 'a'?

- (A) $\frac{1}{2}$
 (B) 2
 (C) 4
 (D) 6

14. Which diagram best illustrates an instantaneous rate of change of zero?



15. The diagram shows the height of a rollercoaster over time. What is the average velocity of the roller coaster, in m/s, between 1 and 4 seconds?



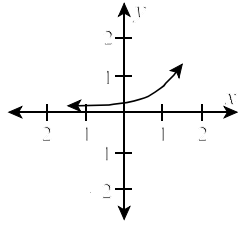
- (A) $-\frac{10}{3}$
 (B) $-\frac{3}{10}$
 (C) $\frac{3}{10}$
 (D) $\frac{10}{3}$
16. Four regressions were performed on a set of data. Without knowing anything else about the data, which seems to produce a curve of best fit?
- (A) $y = -0.16x + 0.78, r^2 = 0.5863$
 (B) $y = -0.03x^3 + 0.41x^2 - 1.73x + 2.33, r^2 = 0.9895$
 (C) $y = 0.08x^2 - 0.73x + 1.54, r^2 = 0.9069$
 (D) $y = 5.17(0.20)^x, r^2 = 0.9997$
17. What transformation of $y = 3(7)^{x-1} - 2$ will produce the graph of $y = 3(7)^{0.5(x-1)} + 4$?
- (A) Horizontal stretch 0.5, vertical translation up 6
 (B) Horizontal stretch 2, horizontal translation right 1, vertical translation up 4
 (C) Horizontal stretch 2, vertical translation up 6
 (D) Horizontal stretch 0.5, horizontal translation down 1, vertical translation down 4
18. Which type of function best models this data?

n	1	2	3	4	5
t_n	5	8	13	20	29

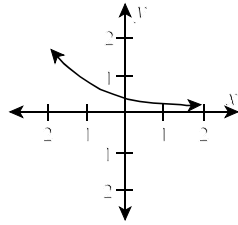
- (A) $t_n = ar^{n-1}, a \neq 0, r > 0$
 (B) $t_n = an + b, a \neq 0$
 (C) $t_n = an^2 + bn + c, a \neq 0$
 (D) $t_n = r^{n-1}, r > 0$
19. What equation of the asymptote of the function $-(y - 3) = 3^{-x}$?
- (A) $y = -3$
 (B) $x = -3$
 (C) $y = 3$
 (D) $x = 3$

20. Which graph best represents the inverse of $y = \log_4 x$?

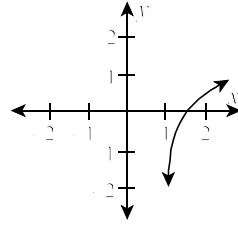
(A)



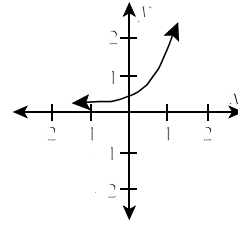
(B)



(C)

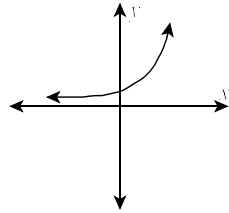


(D)

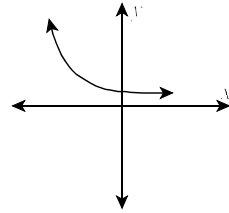


21. Given $y = ab^x$, $a > 0$, which graph represents a function that has the greatest value of b ?

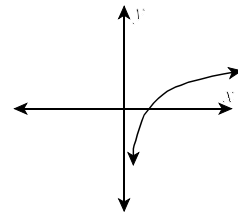
(A)



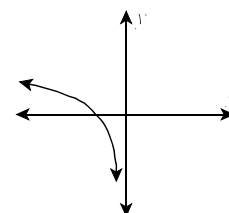
(B)



(C)



(D)



22. Which sequence is geometric?

- (A) $\{1, 2, -4, -8, \dots\}$
- (B) $\{\log 2, \log 4, \log 8, \log 16, \dots\}$
- (C) $\{\frac{2}{3}, \frac{4}{5}, \frac{8}{7}, \frac{16}{9}, \dots\}$
- (D) $\{\sqrt{3}, 3, 3\sqrt{3}, 9, \dots\}$

23. Solve for x : $(\log_3 x)^2 - \log_3 x^2 - 15 = 0$?

- (A) 3
- (B) 5
- (C) 125
- (D) 243

24. Solve for x : $3^{-2(x-1)} = \frac{1}{\sqrt[3]{3}}$?

- (A) $-\frac{5}{6}$
- (B) $\frac{5}{6}$
- (C) $\frac{7}{6}$
- (D) $\frac{14}{3}$

25. Solve for x : $5^{x+2} = 27$?

- (A) -1.51
- (B) -0.41
- (C) 0.05
- (D) 2.05

26. Which is the simplified form of $\frac{(-3n^{-3})^2}{-9n^{-4}}$?

- (A) $-\frac{1}{n^2}$
- (B) $-n^2$
- (C) $\frac{1}{n^2}$
- (D) n^2

27. Which function best represents this data?

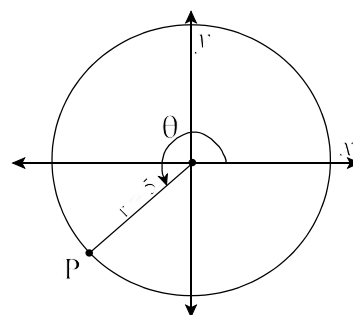
x	-0.3	0	0.3	0.6	0.9
y	40	20	10	5	2.5

- (A) $y = 20(0.1)^{\frac{x}{0.3}}$
- (B) $y = 20(0.5)^{\frac{10}{3}x}$
- (C) $y = 40(0.5)^x$
- (D) $y = 40(0.5)^{\frac{10}{3}x}$

28. Which function describes the transformation of $y = \left(\frac{1}{3}\right)^x$ under the mapping rule $(x, y) \rightarrow (9x, y - 1)$?
- (A) $y + 1 = \left(\frac{1}{3}\right)^{\frac{x}{9}}$
 (B) $y + 1 = \left(\frac{1}{3}\right)^{9x}$
 (C) $y - 1 = \left(\frac{1}{3}\right)^{\frac{x}{9}}$
 (D) $y - 1 = \left(\frac{1}{3}\right)^{9x}$
29. Which is a simplified form of $(x^{-1} + y^{-3})^{-1}$?
- (A) $x + y^3$
 (B) $\frac{xy^3}{x + y^3}$
 (C) $\frac{x + y^3}{xy^3}$
 (D) $\frac{1}{2}$
30. What are the coordinates of the focal point of $y = 3(4)^{x+2} - 5$?
- (A) $(-2, -2)$
 (B) $(-2, 8)$
 (C) $(0, 1)$
 (D) $(0, 43)$
31. What is the converse of:
“If a triangle is inscribed in a semi-circle, then the triangle is a right triangle.”?
- (A) If a triangle is inscribed in a semi-circle, then the triangle is not a right triangle.
 (B) If a triangle is not inscribed in a semi-circle, then the triangle is not a right triangle.
 (C) If a triangle is a right triangle, then it is inscribed in a semi-circle.
 (D) If a triangle is a right triangle, then it cannot be inscribed in a semi-circle.
32. If the graph of $\left[\frac{1}{3}(x - 2)\right]^2 + \left[\frac{1}{3}(y + 4)\right]^2 = 1$ is stretched vertically by a factor of 2, and horizontally by a factor of 5, what is the new equation?
- (A) $\left[\frac{2}{3}(x - 2)\right]^2 + \left[\frac{5}{3}(y + 4)\right]^2 = 1$
 (B) $\left[\frac{5}{3}(x - 2)\right]^2 + \left[\frac{2}{3}(y + 4)\right]^2 = 1$
 (C) $\left[\frac{1}{15}(x - 2)\right]^2 + \left[\frac{1}{6}(y + 4)\right]^2 = 1$
 (D) $\left[\frac{1}{6}(x - 2)\right]^2 + \left[\frac{1}{15}(y + 4)\right]^2 = 1$

33. Using the diagram, which describes the coordinates of point P?

- (A) $(\frac{1}{5}\cos\theta, \frac{1}{5}\sin\theta)$
- (B) $(\frac{1}{5}\sin\theta, \frac{1}{5}\cos\theta)$
- (C) $(5\cos\theta, 5\sin\theta)$
- (D) $(5\sin\theta, 5\cos\theta)$



34. A circle has centre $(-4, \frac{1}{3})$ and one endpoint of a diameter at $(5, -2)$. What are the coordinates of the other endpoint?

- (A) $(-13, 3)$
- (B) $(-13, \frac{8}{3})$
- (C) $(\frac{1}{2}, \frac{8}{3})$
- (D) $(14, -4\frac{1}{3})$

35. What is the transformational form of $x^2 + y^2 + 4x - 9 = 0$?

- (A) $[\frac{1}{\sqrt{13}}(x+2)]^2 + [\frac{1}{\sqrt{13}}y]^2 = 1$
- (B) $\frac{1}{\sqrt{13}}(x+2)^2 + \frac{1}{\sqrt{13}}y^2 = 1$
- (C) $\frac{1}{\sqrt{5}}(x+2)^2 + \frac{1}{\sqrt{5}}y^2 = 1$
- (D) $[\frac{1}{\sqrt{5}}(x+2)]^2 + [\frac{1}{\sqrt{5}}y]^2 = 1$

36. Which is the equation of an ellipse with centre $(-5, 6)$, major axis 4 units and minor axis 2 units?

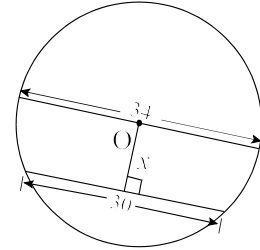
- (A) $(\frac{x-5}{4})^2 + (\frac{y+6}{2})^2 = 1$
- (B) $(\frac{x-5}{2})^2 + (y+6)^2 = 1$
- (C) $(\frac{x+5}{4})^2 + (\frac{y-6}{2})^2 = 1$
- (D) $(\frac{x+5}{2})^2 + (y-6)^2 = 1$

37. Which mapping rule describes the transformation of $x^2 + y^2 = 1$ needed to produce $(x+2)^2 + (y+1)^2 = \frac{1}{4}$?

- (A) $(x, y) \rightarrow (\frac{1}{4}x - 2, \frac{1}{4}y - 1)$
- (B) $(x, y) \rightarrow (\frac{1}{2}x - 2, \frac{1}{2}y - 1)$
- (C) $(x, y) \rightarrow (x - 2, y - 1)$
- (D) $(x, y) \rightarrow (2x - 2, 2y - 1)$

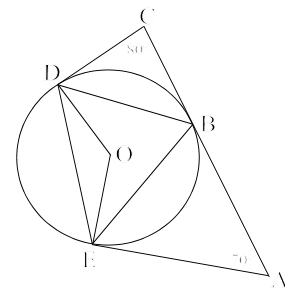
38. If O is the centre of the circle shown, what is the value of x ?

- (A) 4
- (B) 8
- (C) 16
- (D) 64



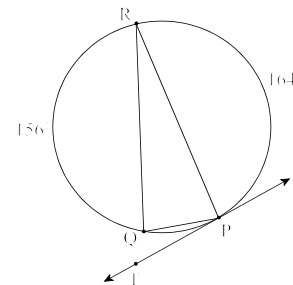
39. If O is the centre of the circle shown having AB, AE, CB and CD as tangents, what is the measure of $\angle DOE$ in degrees?

- (A) 75
- (B) 100
- (C) 110
- (D) 150



40. \overline{PT} is tangent to the circle at P and $\angle QRP$ is inscribed in the circle. What is the measure of $\angle QPT$ in degrees?

- (A) 12
- (B) 20
- (C) 24
- (D) 40



41. What is the exact value of $(\sin 225^\circ)^2 + \tan 30^\circ$?

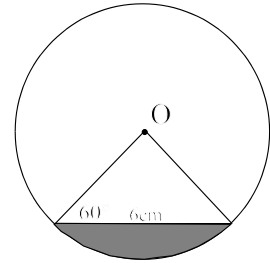
- (A) $\frac{\sqrt{5}}{5}$
- (B) $\frac{1+\sqrt{3}}{5}$
- (C) $\frac{3+2\sqrt{3}}{6}$
- (D) $\frac{3\sqrt{2}+2\sqrt{3}}{6}$

42. If $CD = 10$ and C is at $(8, -3)$ and D is at $(2, y)$, what are all the possible values for y ?

- (A) -11 & 11
- (B) -11 & 5
- (C) -8 & 8
- (D) -5 & 5

43. If O is the centre of the circle, what is the perimeter of the shaded region in centimetres?

- (A) 2π
- (B) $6 + 2\pi$
- (C) $6 + 6\pi$
- (D) 8π



44. Which is a permutation?

- (A) number of ways to award 5 prizes of \$100.00
- (B) number of ways to award 5 prizes valued at \$500.00, \$100.00, \$75.00, \$50.00, and \$25.00
- (C) number of ways to form a committee from 5 students from a class
- (D) number of ways to select three students to put chairs in the gym

45. What is the simplest form of $\frac{{}_n C_r (r-1)!}{{}_n P_r}$?

- (A) 1
- (B) $\frac{1}{r}$
- (C) r
- (D) $\frac{(n-r)!}{r!}$

46. Eight friends are seated around a circular table. What is the total number of different arrangements for seating?

- (A) 5040
- (B) 40320
- (C) 45360
- (D) 362880

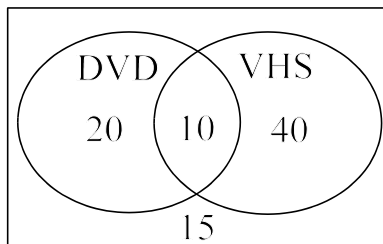
47. What is the value of n in $\frac{(n+1)!}{(n-1)!} = 72$?

- (A) -9
- (B) 8
- (C) 71
- (D) 72

48. This chart displays the number of students who attended a leadership conference. If one student is selected at random, what is $P(\text{Female} | \text{NL})$?

	NL	PEI	TOTAL
Male	8	5	13
Female	10	12	22
TOTAL	18	17	35

- (A) $\frac{2}{7}$
 (B) $\frac{5}{11}$
 (C) $\frac{5}{9}$
 (D) $\frac{22}{35}$
49. A bag contains 5 green marbles, 4 red marbles and 3 yellow marbles. If 2 marbles are taken from the bag at random, without replacement, what is the probability of selecting one red marble and one green one?
- (A) $\left(\frac{1}{3}\right)\left(\frac{5}{12}\right)$
 (B) $\left(\frac{1}{3}\right)\left(\frac{5}{11}\right)$
 (C) $\frac{1}{3} + \frac{5}{11}$
 (D) $\frac{1}{3} + \frac{5}{12}$
50. 85 people were surveyed and asked if they owned a DVD player or a VHS player. The results are shown in the diagram. Based on the diagram, what is the probability that a person owns a DVD **or** a VHS player?



- (A) $\frac{2}{17}$
 (B) $\frac{6}{17}$
 (C) $\frac{10}{17}$
 (D) $\frac{14}{17}$

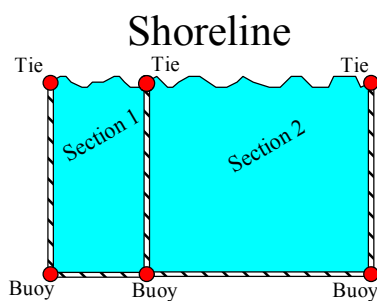
PART II
Total Value: 50%

Answer **ALL** items in the space provided. Show **ALL** workings.

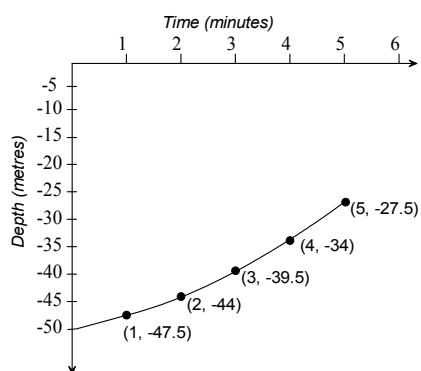
Value

4% 51. Find the exact value of all roots of $\frac{1}{x+5} + \frac{3}{x-1} = 2$.

- 4% 52. A lifeguard must join 3 shoreline ties and 3 anchored buoys (arranged as shown) with single strands of rope to form a rectangular swimming area in 2 sections (no rope runs along the shoreline). The lifeguard uses 600m of rope in total. Find the quadratic function that models this situation, and determine the length and width that will produce a maximum for the entire rectangular swimming area.



- 4% 53. The initial depth of a submarine is 50m below sea level. The following graph shows the distance it rises over a 5 minute period. Algebraically determine the quadratic function that defines the path of the submarine.



Value

3%

54. A cube, presently 10 mm on each side, has side lengths that increase at a uniform rate of 5 mm/sec. Find the approximate instantaneous rate of change of volume of the cube after 3 seconds.

4%

55. Solve for x : $8^{2x} + 8^x - 12 = 0$

3%

56. Solve for x : $\log_7(x - 2) + \log_7(x + 4) = 1$

Value

4% 57. Two ATVs were bought at the same time. One ATV cost \$10 000 and depreciates at 22% yearly. The other ATV cost \$8000 and depreciates at 18% yearly. Algebraically determine the number of years it will take for the two ATVs to be of equal value.

4% 58. A cup of hot water was left to cool in a room. The room temperature was 21°C . The temperature of the water was recorded as shown in the table. Find the exponential function that models the cooling behaviour of the water and use it to determine the temperature of the water after 14 minutes.

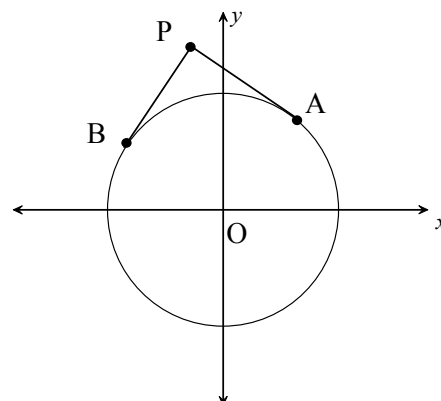
<i>Time (minutes)</i>	<i>Temperature ($^{\circ}\text{C}$)</i>
0	70
4	68
8	65
12	63

3% 59. Algebraically show that the line $5x - 2y - 11 = 0$ passes through the centre of $2x^2 + 3y^2 - 4x + 18y - 7 = 0$?

Value

3%

60. $A(3, 4)$ and $B(-4, 3)$ are points on the circle shown having centre O and tangents \overline{PA} and \overline{PB} . If the slope of \overline{AO} is $\frac{4}{3}$, and the slope of \overline{BO} is $-\frac{3}{4}$, what are the coordinates of point P ?



4%

61. Using coordinate geometry, prove that the midpoint of the hypotenuse of a right triangle is equidistant from all three of its vertices.

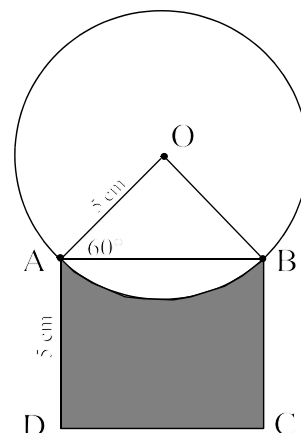
3%

62. A circle passes through the point $(0, 0)$ and intersects the x -axis at 6 and the y -axis at 8. What is the equation of the circle?

Value

4%

63. A sector of a circle, centre O , and a square $ABCD$, share points A and B as shown. If $\angle OAB$ is 60° , and $OA = AD = 5\text{cm}$, what is the area of the shaded region to the nearest cm^2 ?



3%

64. An engineer calculates that, for a one year period, the probability of a certain car having a flat tire is 22% , and having engine failure is 7% . Using a tree diagram, calculate the probability that a randomly selected car of this type will have a flat tire and will not have engine failure.