BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

Skills 1

(i) Write down the equation of each circle:

(a) Centre $(3,2)$, radius 4

(b) Centre $(-4,5)$, radius 6

(c) Centre $(5,-6)$, radius $2\sqrt{3}$

(d) Centre $(2a,7a)$, radius $5a$

(e) Centre $\left(-2\sqrt{2},-3\sqrt{2}\right)$, radius 1

TAP FOR ANSWERS

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Skills 1

ii) By completing the square in the x terms and the y terms, write the following circle equations in the form $(x-a)^2+(y-b)^2=r^2$, and hence state the centre and radius:

(a) $x^2+y^2-2x+8y-8=0$

(b) $x^2+y^2+12x-4y=9$

(c) $x^2+y^2-6y=22x-40$

(d) $x^2+y^2+5x-y+4=2y+8$

(e) $2x^2+2y^2-6x+5y=2x-3y-3$

TAP FOR ANSWERS

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Skills 2

Find the equation of the tangent to the following circles at the stated point, giving your answer in the form $ax + by + c = 0$

(a) $(x - 1)^2 + (y + 2)^2 = 13$ at the point (3, 1)

(b) $(x + 3)^2 + (y - 5)^2 = 34$ at the point (0, 0)

(c) $(x - 3)^2 + (y + 2)^2 = 13$ at the point (6, -4)

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

Skills 1 - Answers

i)

(a) $(x-3)^2+(y-2)^2=16$

(b) $(x+4)^2+(y-5)^2=36$

(c) $(x-5)^2+(y+6)^2=12$

(d) $(x-2a)^2+(y-7a)^2=25a^2$

(e) $\left(x+2\sqrt{2}\right)^2+\left(y+3\sqrt{2}\right)^2=1$

TAP TO RETURN

Skills 1 - Answers

ii)

(a) Centre $(1, -4)$, radius 5

(b) Centre $(-6,2)$, radius 7

(c) Centre $(11,3)$, radius $3\sqrt{10}$

(d) Centre $\left(-\frac{5}{2}, \frac{3}{2}\right)$, radius $\frac{5\sqrt{2}}{2}$

(e) Centre $(2, -2)$, radius $\sqrt{\frac{13}{2}}$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

Skills 2 – Answers

(a) $2x + 3y - 9 = 0$

(b) $3x - 5y = 0$

(c) $3x - 2y - 26 = 0$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

1

(a) Given $f(x) = (x) = 2x^2 - 3x + 4$ and $g(x) = 4x + 1$
Sketch the graphs of $y = f(x)$ and $y = g(x)$ on the same axes

(b) Find the coordinates of any points of intersection.

(c) Write down the set of values for which $f(x) > g(x)$

(d) Write down the set of values for which $f(x) < g(x)$

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

2

The number of bacteria in a refrigerated food is given by

$$N = 20T^2 + 120 - 20T, \qquad T > 0$$

where T is the temperature of food in ^{0}C

(a) Express N in the form $p(T - q)^2 - r$ where p, q, r are integers to be found

(b) What is the minimal number of bacteria and what is the temperature when this occurs?

(c) Find the temperature to 3 sf when the number of bacteria is 140

(d) Explain why $T > 0$.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

3

The curve C_1 has equation $y = -\frac{a}{x^2}$ where a is a positive constant. The curve C_2 has the equation $y = x^2(3x + b)$ where b is a positive constant.

(a) Sketch $C_1$and C_2 on the same set of axes, showing clearly the coordinates of any point where the curves touch of cross the axes.

(b) Using your sketch state, giving reasons, the number of solutions to the equation $x^4(3x + b) + a = 0$.

TAP FOR ANSWERS

4

The line l_1 has equation $x + 2y - 1 = 0$. The line l_2 is perpendicular to l_1 and passes through the point $A(1, 5)$.

(a) Show that l_1 and l_2 cross at the point $(-1, 1)$

The points $B(-3, 2)$ and $C(3, -1)$ lie on l_1.

(b) Find the area of the triangle with vertices A, B, C.

TAP FOR ANSWERS

5

(a) Find the equation of the circle where the points (1, 0) and (3, 0) are at either end of the diameter.

(b) The circle has a tangent at point *A* that also passes through the point *B* (6, 0). Find the distance *AB*.

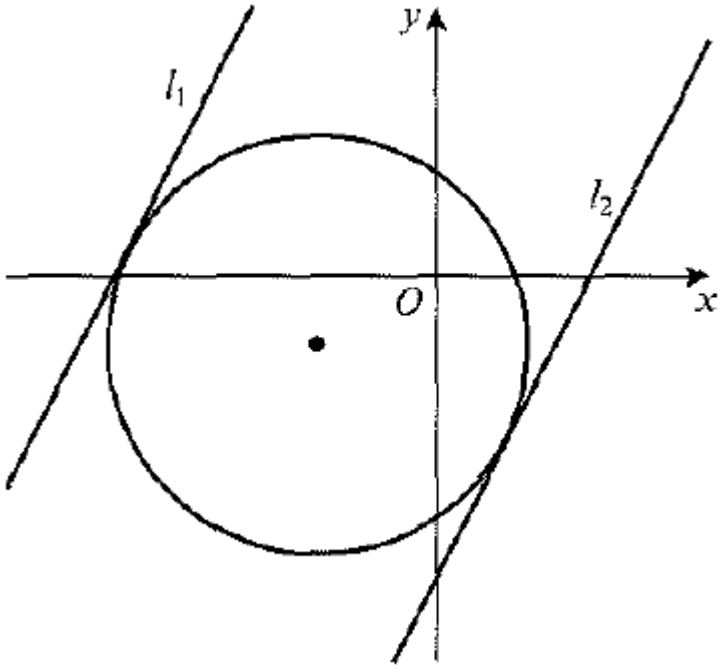
TAP FOR ANSWERS

6

The circle C has equation $(x + 5)^2 + (y + 3)^2 = 80$.

The line l is a tangent to the circle and has gradient 2.

Find two possible equations for l giving your answers in the form $y = mx + c$



TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

7

A girl runs a 400 m race in a time of 84 s. In a model of this race, it is assumed that, starting from rest, she moves with constant acceleration for 4 s, reaching a speed of 5 m s^{-1}. She maintains this speed for 60 s and then moves with constant deceleration for 20 s, crossing the finishing line with a speed of V m s^{-1}.

(a) Sketch a speed-time graph for the motion of the girl during the whole race.

(b) Find the distance run by the girl in the first 64 s of the race.

(c) Find the value of V.

(d) Find the deceleration of the girl in the final 20 s of her race.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

8

A racing car modelled as a particle starts from rest at the point A and moves in a straight line with constant acceleration for 30 s until it reaches point C. The speed of the car at C is 75 m s^{-1}.

(a) Calculate the acceleration of the car.

(b) If B is a point between A and C such that AB = 245 m, calculate the distance BC.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

9

NEW TECHNIQUES!

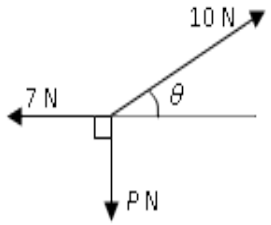
A 5 kg box rests on a smooth plane inclined at 20° to the horizontal. It is held in equilibrium by a light inextensible string acting parallel to the plane. What is the tension in the string?

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

10

Three forces, of magnitude 10 N, 7N and P N, act at a point in the directions as shown in the diagram.



The forces are in equilibrium. By resolving in appropriate directions,

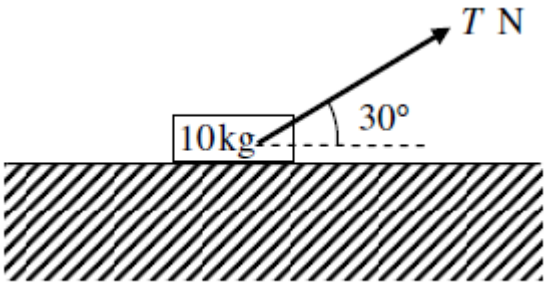
(a) find the value of θ.

(b) find the value of P.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

11



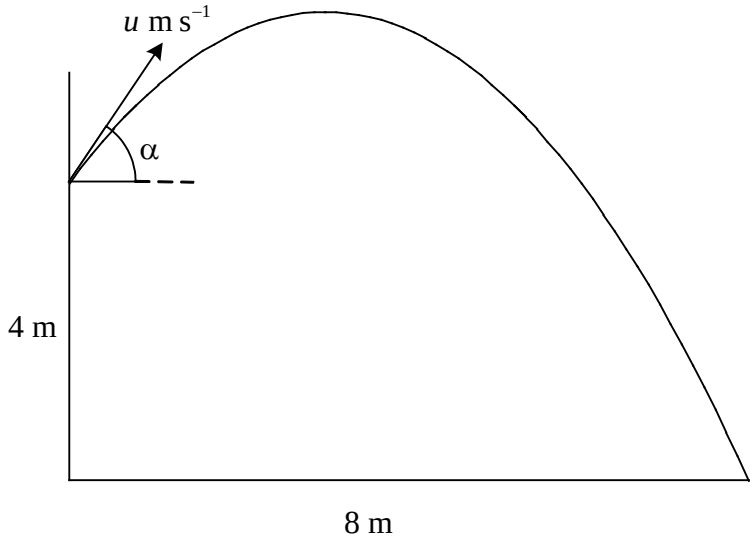
The figure above shows a small box of mass of 10kg, pulled by a rope inclined at 30^o to the horizontal, along rough horizontal ground

The tension in the rope is T N and the particle is accelerating at $0.4\ ms^{-2}$. The box is modelled as a particle experiencing a frictional force of $12N$ and a formal reaction of R N.

Determine the value of T and the value of R.

TAP FOR ANSWERS

12



A ball is thrown from a point 4 m above horizontal ground. The ball is projected at an angle α above the horizontal, where $\tan\alpha = \frac{3}{4}$. The ball hits the ground at a point which is a horizontal distance 8 m from its point of projection, as shown.

The initial speed of the ball is u m s $^{-1}$ and the time of flight is T seconds.

TAP FOR ANSWERS

12

(a) Prove that $uT = 10$.

(b) Find the value of u.

As the ball hits the ground, its direction of motion makes an angle $\emptyset$ with the horizontal.

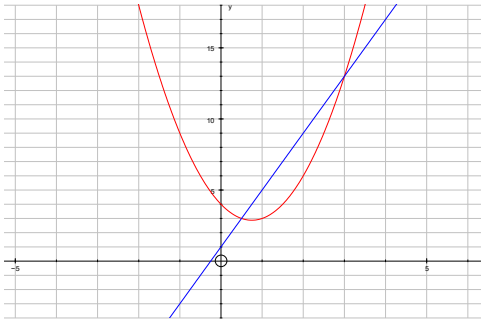
(c) Find $\tan \emptyset$.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

1 - Answers

(a)



(b) $\left(\frac{1}{2}, 3\right)$ (3,13)

(c) $x < \frac{1}{2}$ *or* $x > 3$

(d) $\frac{1}{2} < x < 3$

TAP TO RETURN

2 - Answers

(a) $p = 20, q = 0.5, r = 115$

(b) Min = 115 when T = 0.5

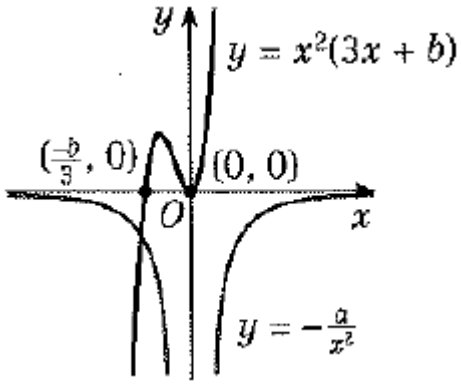
(c) 1.62°C

(d) The amount of bacteria doesn't increase if the temperature goes down

TAP TO RETURN

3 - Answers

(a)



(b) 1; only one intersection of the two curves.

TAP TO RETURN

4 - Answers

(a) (-1,1)

(b) 15

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 5B

5 - Answers

(a) $(x-2)^2 + y^2 = 1$

(b) $\sqrt{15}$

TAP TO RETURN

6 - Answers

$y = 2x + 27$ and $y = 2x - 13$

TAP TO RETURN

7 - Answers

(b) 310m

(c) $4ms^{-1}$

(d) $0.05ms^{-2}$

TAP TO RETURN

8 - Answers

(a) $a = 2.5\text{ms}^{-2}$

(b) BC = 880m

TAP TO RETURN

9 - Answers

17N

TAP TO RETURN

10 - Answers

(a) $\theta=45.6^{o}$,

(b) P=7.14N

TAP TO RETURN

11 - Answers

(a) $T =$ 18.5 N $\quad R = 88.8$ N

TAP TO RETURN

12 - Answers

(b) 7

(c) 7/4

TAP TO RETURN