Year 12 Week 7 Mixed Exam Questions

(Mostly Edexcel via DrFrostMaths)

Question	1	2	3	4	5	6	7	8	Total
Marks									
Max Marks	2	4	5	4	5	3	5	4	32

TRY IN EXAM CONDITIONS FIRST (35 MINUTES), THEN USE THE MARK SCHEME TO SCORE AND *HELP* CORRECT YOUR WORK.

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1. Express

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

as a single fraction in its simplest form.

(2 marks)

2. Express $3x^2-5x+1$ in the form $a(x+b)^2+c$

(4 marks)

3. Solve the equation

$$x^6+26x^3-27=0$$

(5 marks)

4. Solve the equation

$$2^{2x+5}-7(2^x)=0$$

giving your answer to 2 decimal places.

(*Solutions based entirely on graphical or numerical methods are not acceptable.*)

(4 marks)

5. Solve the equation

$$2y^{\frac{1}{2}}-7y^{\frac{1}{4}}+3=0$$

(5 marks)

Question 6

The line l_1 has equation $3x+5y-2=0$.

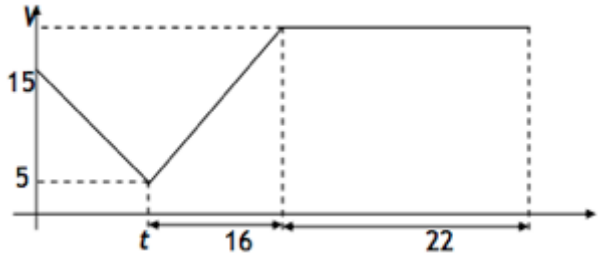
The line l_2 is perpendicular to l_1 and passes through the point $(3,1)$.
Find the equation of l_2 in the form $y=mx+c$, where m and c are constants.

(3 marks)

7. A car moves along a horizontal straight road, passing two points *A* and *B*. At *A* the speed of the car is 15 m s^{-1}. When the driver passes *A*, he sees a warning sign *W* ahead of him, 120 m away. He immediately applies the brakes and the car decelerates with uniform deceleration, reaching *W* with speed 5 m s^{-1}. At *W*, the driver sees that the road is clear.

He then immediately accelerates the car with uniform acceleration for 16 s to reach a speed of *V* m s^{-1} (*V* > 15). He then maintains the car at a constant speed of *V* m s^{-1}. Moving at this constant speed, the car passes *B* after a further 22 s.

A speed-time graph to illustrate the motion of the car as it moves from *A* to *B* is sketched below.

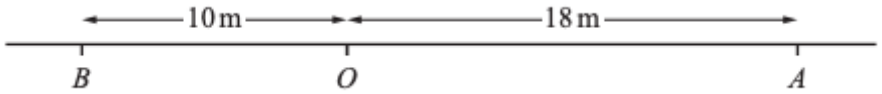


The distance from *A* to *B* is 1 km.

Find the value of *V*.

(5 marks)

8. (a)



A particle P is moving along a straight line with constant acceleration. Initially the particle is at O. After 9 s, P is at a point A, where $OA = 18$ m (see diagram) and the velocity of P at A is 8 m s^{-1} in the direction OA.

The initial speed of P is 4 m s^{-1}.

Find the acceleration of P.

(2 marks)

8. (b)

A particle accelerates uniformly whilst moving on a straight line from A to B .A and B are $240m$ apart.
The particle takes 18 seconds to travel from A to B .
At B, the velocity of the particle is $6ms^{-1}$.

Find the velocity of the particle at A .

(1 mark)

8. (c)

A particle is moving along a straight line with constant deceleration $2.5ms^{-2}$. At $t = 0$, the velocity of the particle is $8ms^{-1}$.

Find the time taken for the velocity of the particle to become $3ms^{-1}$.

(1 mark)

Answers

Question 1

$\frac{11-x}{(3-x)(1+x)}$

$\frac{2(1+x)+3(3-x)}{(3-x)(1+x)}$	**B1**
$\frac{11-x}{(3-x)(1+x)}$ oe isw	**B1**

Question 2

$3\left(x-\frac{5}{6}\right)^2-\frac{13}{12}$

$3(x^2-\frac{5}{3}x)+1$	B1
$3[(x-\frac{5}{6})^2-\frac{25}{36}]+1$	B1
$3(x-\frac{5}{6})^2-\frac{13}{12}$	M1
	A1

Question 3

$x=-3$ or $x=1$

$k=x^3$	*M1
$k^2+26k-27=0$	A1
$k=-27,1$	A1
	DM1
$x=-3,1$	A1

Question 4

$$x=-2.19$$

$32(2^{2x})-7(2^x)=0$	Deals with power 5 correctly giving ×32	M1
So, $2^x=\frac{7}{32}$	$2^x=\frac{7}{32}$ or $y=\frac{7}{32}$ or awrt 0.219	A1 oe dM1
$x\log 2=\log\left(\frac{7}{32}\right)$ or $x=\frac{\log\left(\frac{7}{32}\right)}{\log 2}$ or $x=\log_2\left(\frac{7}{32}\right)$	A valid method for solving $2^x=\frac{7}{32}$ Or $2^x=k$ to achieve $x=...$	
$x=-2.192645...$	awrt -2.19	A1

Question 5

$y=\frac{1}{16}$ or $y=81$

Let $y^{\frac{1}{4}} = x$	**M1***
$2x^2 - 7x + 3 = 0$	
$(2x-1)(x-3) = 0$	**M1dep***
$x = \frac{1}{2}, x = 3$	**A1**
$y = \left(\frac{1}{2}\right)^4, y = 3^4$	**M1dep***
$y = \frac{1}{16}, y = 81$	**A1**

Question 6

$y = \frac{5}{3}x - 4$

(b) Gradient of perp. line $= \frac{-1}{"\left(-\frac{3}{5}\right)"}$ (Using $-\frac{1}{m}$ with the m from part (a))	M1	
$y - 1 = "\left(\frac{5}{3}\right)"(x-3)$	M1	
$y = \frac{5}{3}x - 4$ (Must be in this form... allow $y = \frac{5}{3}x - \frac{12}{3}$ but not $y = \frac{5x-12}{3}$)	A1	(3)

Question 7

$V = 28 \text{ m s}^{-1}$

(c)	$120 + \frac{1}{2}(V+5)\,16 + 22V = 1000$		M1 B1 A1
	Solve: $30V = 840 \Rightarrow V = 28$		DM1 A1 (5)

Question 8

(a)

$a = \frac{4}{3}$

eg $8 = -4 + 9a$	**M1**	**3.4**	Use of $v = u + at$ with their u **or** $s = vt - \frac{1}{2}at^2$ **or** $v^2 = u^2 + 2as$ with their u **or** $s = ut + \frac{1}{2}at^2$ with their u
$a = \frac{4}{3}$ (m s^{-2})	**A1**	**1.1**	Accept 1.33 or better

(b)

20.7 ms^{-1} (1 mark)

(c)

2 seconds (1 mark)