

## HIGHER TIER TEST

CALCULATORS ARE ALLOWED. A FORMULA SHEET WILL BE REQUIRED.  
WRITE YOUR ANSWERS, **INCLUDING ROUGH WORKING**, ON THESE SHEETS

1. A grouped frequency distribution of the marks scored by 80 girls in an English examination is given in the table below.

Mark	Frequency	Mid-point
0 to 19	7	10
20 to 39	9	30
40 to 59	24	
60 to 79	35	
80 to 99	5	

- a) Complete the mid-point column and calculate an estimate for the mean mark scored by these girls.

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- b) Calculate an estimate for the standard deviation of these marks.

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- c) Each pupil had her mark for the examination increased by 5 marks for good spelling, punctuation and grammar. State estimates for the mean and standard deviation of the increased marks.

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2. On April 1<sup>st</sup> Martin owed £350 on his credit card account.  
The credit card company requires Martin to pay at least 10% of the balance on the 20<sup>th</sup> of each month.

The company charges interest at 2% on what the balance is on the 28<sup>th</sup> of every month.

Martin pays the minimum payment on time every month.

Write down full details of his account up to May 31<sup>st</sup>.

...April 1<sup>st</sup> .....£350.....

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...April 20<sup>th</sup>.....

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...April 28<sup>th</sup>.....

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...May 20<sup>th</sup>.....

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...May 31<sup>st</sup>.....

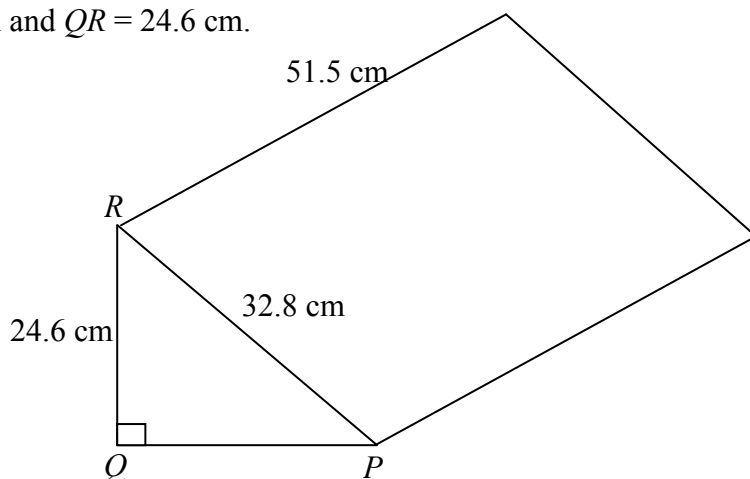
3. Expand and simplify  $4(5x - 2) + 3(x - 2)$

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4. Use your calculator to find the value of  $\frac{\sqrt{924.8}}{328.5 - 154.9}$  correct to 2 decimal places.

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5. The diagram shows a right-angled triangular prism of length 51.5 cm. The cross-section,  $PQR$ , is such that  $PR$  is 32.8 cm and  $QR = 24.6$  cm.



a) Calculate the length of  $PQ$ .

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b) The density of the material from which the prism is made is  $3.5 \text{ g/cm}^3$ . Calculate the mass of the prism in kilograms.

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6. A solution to the equation  $x^3 - 5x - 2 = 0$  lies between 2.4 and 2.5. Use the method of trial and improvement to find this solution correct to 2 decimal places.

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7. a) Simplify  $(4x^3)^2$ .

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b) Expand the following expression, simplifying your answer as far as possible.  
 $(x + 2)(x - 6)$ .

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c) Make  $d$  the subject of the following formula.  $5(d - 3e) = 12 + 2e$ .

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8. a) The following numbers have been written in standard form. Write **each** in decimal form.

i)  $(5.2 \times 10^7)$ .

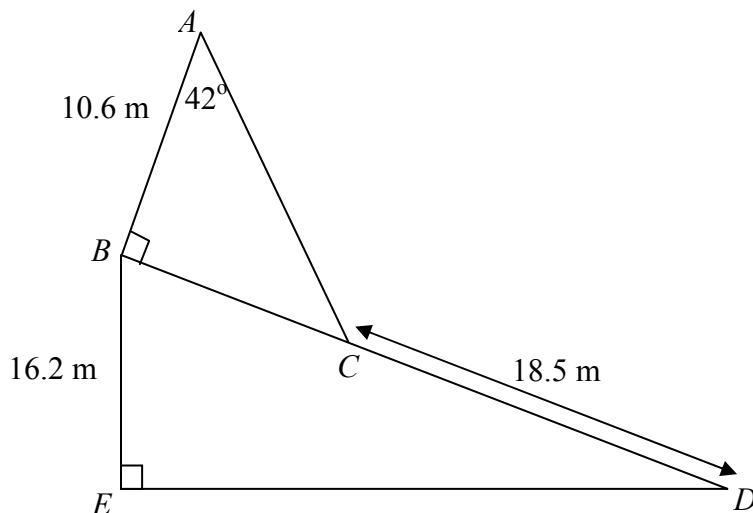
ii)  $(3.5 \times 10^{-3})$ .

b) Find, in standard form, the value of:

i)  $(5.2 \times 10^8) \times (8.6 \times 10^5)$ .

ii)  $(7.2 \times 10^{-8}) \div (9.6 \times 10^4)$ .

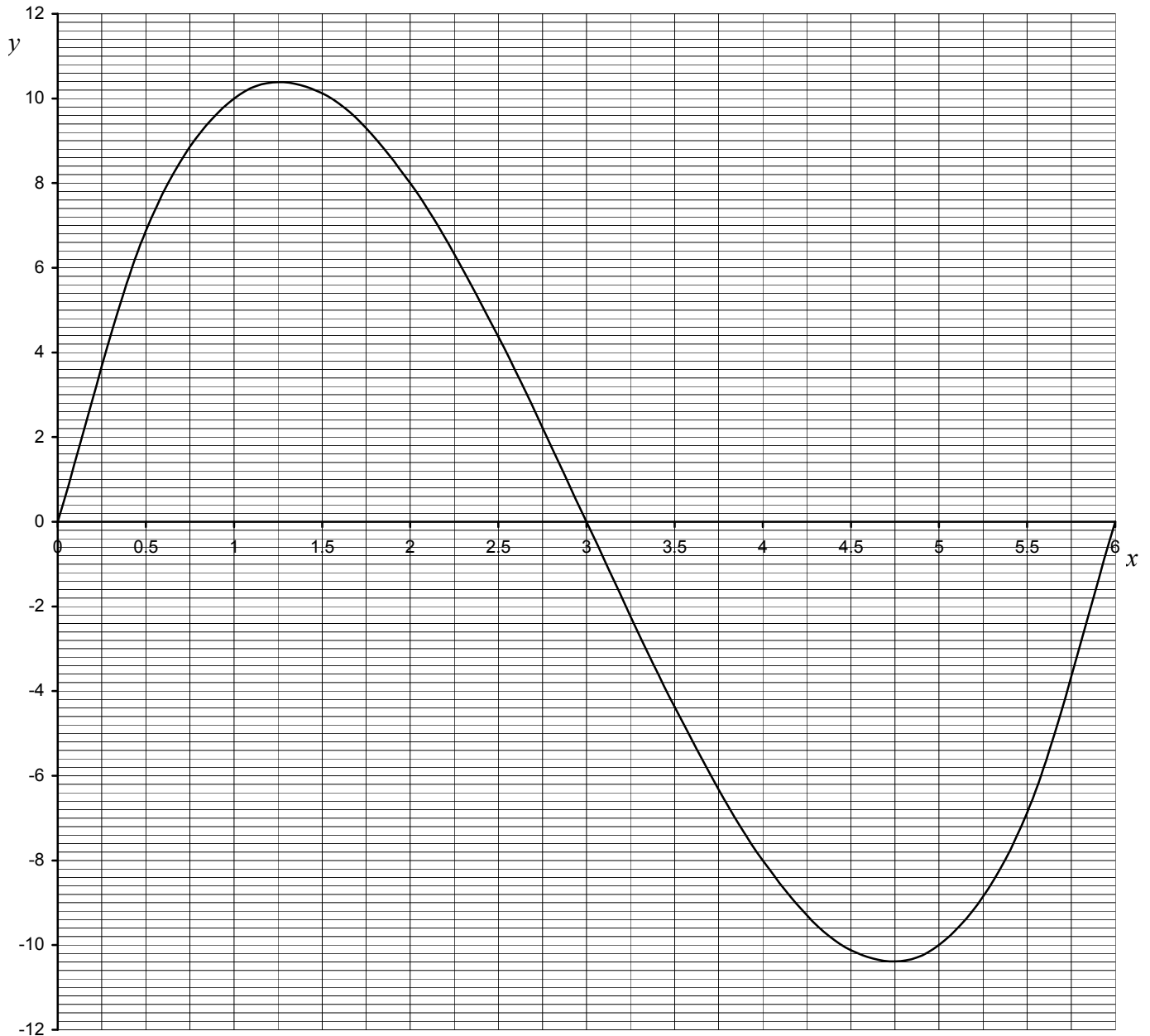
9. In the diagram below,  $\hat{A}BC = 90^\circ$ ,  $\hat{B}ED = 90^\circ$ ,  $AB = 10.6$  m,  $CD = 18.5$  m,  $BE = 16.2$  m and  $\hat{B}AC = 42^\circ$ .







14. The graph shows the curve  $y = x^3 - 9x^2 + 18x$  between  $x = 0$  and  $x = 6$ .



- a) i) Write down the value of  $x$  at a point where the gradient of the curve = 0.  
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- ii) Use the graph to estimate the gradient of the curve at  $x = 2$ .  
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- b) By drawing an appropriate line on your graph, find the value of  $x$  which satisfies the equation  $x^3 - 9x^2 + 17x + 4 = 0$  and lies between  $x = 0$  and  $x = 6$ .  
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- c) Use the trapezium rule with 3 strips to estimate the area enclosed by the  $x$ -axis and the curve between  $x = 0$  and  $x = 3$ .  
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### Answers.

1. a) mid-points 10, 30, 50, 70, 90; mean = 55.5, b) 20.73041244, c) mean increases to 60.5, standard deviation measures *how spread out the marks are* and so remains unchanged at 20.73041244.
2. April 20<sup>th</sup> = £315, April 28<sup>th</sup> = £321.30, May 20<sup>th</sup> = £289.17, May 31<sup>st</sup> = £294.95.
3.  $23x - 14$ .
4. 0.18.
5. a) 21.69516075 cm  
b) {Calculate the volume of the prism first. This tells you how many cm<sup>3</sup> we are dealing with etc.} 48.09979852 kg.
6.  $x = 2.41$  to 2 decimal places.
7. a)  $16x^6$       b)  $x^2 - 4x - 12$       c)  $d = \frac{12 + 17e}{5}$ .
8. a) i) 52000000    ii) 0.0035      b) i)  $4.472 \times 10^{14}$       ii)  $7.5 \times 10^{-13}$ .
9. {Use  $S^O_H C^A_H T^O_A$  in right angled triangle  $ABC$  and then in right angled triangle  $BDE$ .}  
 $BDE = 35.28597597^\circ$ .
10. {Take care with negative numbers in your working!}  $x = -5$ .
11. {You are told that  $y$  is **directly** proportional to  $t$  and so there is a formula connecting  $t$  and  $y$  of the form  $y = k \times t^2$ . All you have to do is use the given information to find the value of  $k$ .}  
a)  $y = 4.5t^2$       b) i) 40.5 grams    ii) 8 minutes.
12. a) {Pythagoras!}      b)  $x = 1.550510257$  or  $x = 6.449489743$   
c) 6.449489743 cm, 5.449489743 cm and 3.449489743 cm.
13. a) {The volume of a cone is  $\frac{1}{3} \pi r^2 h$ . Use scale-factors to work out the radius of the small cone.}  
 $167.5516082 \text{ cm}^3$   
b) {Divide the answer to a) by 10. The volume of a cylinder is  $\pi r^2 h$  etc.} 1.46 cm to 2 decimal places.
14. a) i)  $x \approx 1.25$  or  $4.75$       ii)  $-6$       b) Draw  $y = x - 4$ ,  $x \approx 3.1$   
c)  $18 \text{ cm}^2$ .