Practice Unit Assessment (2) for National 5 Applications

 A children's play park, which is triangular in shape, has to be covered with a protective matting. The diagram gives the dimensions of the plot.



Calculate the area, to the nearest square metre, of protective matting needed.

2. The diagram shows the courses followed by two ships, the Westminster and the Bogota, after they leave Port A. The Westminster sails 520 metres to position W and the Bogota 580 metres to position B.



How far apart are the ships?[i.e. the distance WB on the diagram]

3. On a radar screen, three planes, P, Q and R are at the positions shown in the diagram.



R is 300 kilometres from Q and 450 kilometres from P. R is on a bearing of 132° from Q.

Calculate the bearing of R from P. i.e. the size of angle NPR in the diagram. Give your answer to the nearest degree.

4. The diagrams below show 2 directed line segments *a* and *b*.





5. The diagram below shows a square based model of a glass pyramid of height 10 cm. Square OPQR has a side length of 8 cm.

The coordinates of R are (0, 8, 0). P lies on the *x*-axis.



Write down the coordinates of S.

6. The forces acting on a body are represented by three vectors *k*, *l* and *m* as given below.

$$\boldsymbol{k} = \begin{pmatrix} 3 \\ 2 \cdot 5 \\ -4 \end{pmatrix} \qquad \boldsymbol{l} = \begin{pmatrix} 2 \\ 4 \\ 1 \cdot 5 \end{pmatrix} \qquad \boldsymbol{m} = \begin{pmatrix} -3 \cdot 5 \\ 0 \\ -4 \end{pmatrix}$$

Find the resultant force.

7. Vector $\boldsymbol{a} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$ and vector $\boldsymbol{b} = \begin{pmatrix} -2 \\ -5 \end{pmatrix}$.

Calculate | a + 2b |

- 8. Due to inflation, house prices are expected to rise by 3.6% each year. What will the average house price be in 3 years if it is £142,000 today?
- 9. A room has dimensions as shown in the diagram.



Calculate the exact amount of carpet that would have to be bought for the room.

10. A woman bought an antique painting last year.

It has increased in value by 35% and is now worth \pounds 3 510.

Calculate how much the woman paid for the painting.

11. A quality control examiner on a production line measures the weight, in grams, of cakes coming off the line. In a sample of eight cakes the weights were

150 147 148 153 149 143 145 149

- (a) Find the mean and standard deviation of the above weights.
- (b) On a second production line, a sample of 8 cakes gives a mean of 148 and a standard deviation of $6 \cdot 1$.

Using these statistics, compare the profits of the two companies and make two valid comparisons.

12. The diagram below shows the connection between the thickness of insulation in a roof and the heat lost through the roof. The line of best fit has been drawn.



- (a) Determine the gradient and the *y*-intercept of the line of best fit shown.
- (b) Using these values for the gradient and the *y*-intercept, write down the equation of the line.
- (c) Estimate the thickness of insulation for a heat loss of 2.5 kilowatts.

End of Question Paper

Marking Scheme

Points of reasoning are marked # in the table.

Question	Main points of expected responses		
1	• ¹ substitute into formula • ¹ $\frac{1}{2} \times 22 \times 24 \times \sin 56^{\circ}$		
	• ² correct answer • ² 219 m ²		
2	• ¹ use correct formula • ¹ selects cosine rule		
	• ² substitute correctly $a^2 = 520^2 + 580^2 - 2 \times 520 \times 580^2$	×cos14°	
	• ³ process to a^2 • ³ 21517		
	• ⁴ take square root • ⁴ 146.7 metres (rounding not required)		
3	#2.1 uses correct strategy #2.1 sin $P = \frac{300 \sin 132^{\circ}}{450}$ then steps below	valid	
	• ¹ finds angle P • ¹ 29.7°		
	• ² states bearing from P \bullet^2 150.3° (rounding not require	ed)	
4	• ¹ draws $2a$		
	• ² applies head-to-tail method when adding 2b 2a		
	• ³ draws resultant from tail of $2a$ to head of $2b$		
-			
5	• correct point $(4, 4, 10)$		

6	 add to get resultant correct answer 	• ¹ $\begin{pmatrix} 3\\2\cdot5\\-4 \end{pmatrix} + \begin{pmatrix} 2\\4\\1\cdot5 \end{pmatrix} + \begin{pmatrix} -3\cdot5\\0\\-4 \end{pmatrix}$ • ² $\begin{pmatrix} 1\cdot5\\6\cdot5\\-6\cdot5 \end{pmatrix}$
7	• ¹ correct scalar multiplication then addition	• ¹ $\binom{3}{6} + \binom{-4}{-10} = \binom{-1}{-4}$
	• ² calculate magnitude	• ² $\sqrt{(-1)^2 + (-4)^2}$
	• ³ correct answer	\bullet^3 $\sqrt{17}$
8	\bullet^1 start calculation	• ¹ 1.036
	\bullet^2 process calculation	• ² $142\ 000 \times 1.036^{3}$
	\bullet^3 correct answer	• ³ £157 894
	Note: repeated addition method can be used	equivalent
9	• ¹ area calculation	• $\frac{35}{\times 11}$
	\bullet^2 correct answer	• ² $\frac{385}{32} = 12\frac{1}{32}$ m ²
10	#2.1 appropriate strategy	#2.1 eg 1 + $0.35 x = £3510$
	• ¹ correct answer	• 1 ± 2600
11 (a)	• ¹ mean for A	• ¹ 1184 ÷ 8 = 148
	• ² calculates $(x - \bar{x})^2$	• ² 4, 1, 0, 25, 1, 25, 9, 1
	• ³ substitute into formula	$\bullet^3 \qquad \sqrt{\frac{66}{7}}$
	• ⁴ correct standard Deviation	• ⁴ 3.07 (rounding not required) (Equivalent calculations can be used)
(b)	#2.2 Compares mean and standard deviation in a valid way for data	#2.2 On average weights the same Wider spread on second line.

12 (a)	• ¹ chooses 2 distinct points and substitutes into gradient formula	•1 $m = \frac{20 - 10}{1 \cdot 5 - 3 \cdot 5}$ •2 $m = -5$ (or based on gradient line of best fit
	 calculates gradient ³ finds intercept 	• ³ $c = 27.5$ (approximately or by calculation or from graph)
(b)	• ⁴ writes down equation	• ⁴ $T = -5H + 27.5$ (or equivalent)
(c)	# 2.2 estimate mark	#2.2 Approximately 15 cm