**F.3 Mathematics – SOLUTIONS for NCM 3B Chapter 12 Supplementary Worksheet**

**Level 1**

1. units

 units

 units

 units

 units

  *RS* = *ST*

 ∴ 

 *k*2 – 6*k* + 34 = 64 – 16*k* + *k*2

 10*k* = 30

 *k* = 3

*x*

*y*

*Oy*

*P*(3, –1)

*Q*(5, 3)

*R*(1, 1)

*S*(–1, –3)

2. units

 units

 units

 units

 units

 units

 units

 units

 units

 units

 units

 units

 Since *PQ* = *QR* = *RS* = *SP*, *PQRS* is a rhombus.

3. units

 units

 units

 units

 units

 units

 units

 units

 units

  *AB* = *BC*

 ∴ △*ABC* is an isosceles triangle.

 Slope of *AB* = 

 

 Slope of *BC* = 

 

  Slope of *AB* × slope of *BC* =  = –1

 ∴ *AB* ⊥ *BC*

 ∴ △*ABC* is an isosceles right-angled triangle.

4. (a) Slope of *AB* =  = 

 i.e. = 2

 –2 = 2(*m* – 2)

 2*m* = 2

 *m* = 1

 (b) Slope of *CD* = 

 = 

 = *n* – 3

 i.e. 

 5(*n* – 3) = –1

 5*n* = 14

 

5. (a) Slope of *AP* =  = 

 i.e. 

 

 (b) Let the coordinates of point *B* be (0 , *y*).

 Slope of *AB* =  = 

 i.e. 

 *y* = 2

 ∴ The coordinates of point *B* is (0 , 2).

 ∴ Distances between the points *A* and *B* = units

= units

= 3.61 units, *cor*. *to 3 sig*. *fig*.

6. (a) Slope of *L*1 =  = 

 Slope of *L*2 =  = 

  *L*1 // *L*2

 ∴ Slope of *L*1 = slope of *L*2

 

1. Slope of *L*3 = = = 

 Slope of *L*4 =  = 

  *L*3 ⊥ *L*4

 ∴ Slope of *L*3 × slope of *L*4 = –1

 

1. Slope of *BA* = 

Slope of *CD* = 

  Slope of *BA* = slope of *CD*

 ∴ *BA* // *CD*

 units

 units

 units

 units

 units

 units

 ∴ *BA* = *CD*

 ∴ *ABCD* is a parallelogram (*2 sides equal and* //).

8. Consider the *x*-coordinate of point *M*: 



 Consider the *y*-coordinate of point *M*: 



9. Let (*a* , *b*) be the coordinates of point *Q*. We have *PN* : *NQ* = 2 : 1.

 Consider the *x*-coordinate of point *N*: 



 Consider the *y*-coordinate of point *N*: 



 ∴ The coordinates of point *Q* are (3 , –6).

10. Slope of *OB* =  = 1

 Slope of *AC* =  =  = –1

 Slope of *OB* × slope of *AC* = 1 × (–1) = –1

 ∴ *OB* ⊥ *AC*

**Level 2**

1. (a) Let the coordinates of point *C* be (*a* , 0).

 units

 units

 units

 units = (*a* + 4) units

  *AC* = *BC*

 ∴ = *a* + 4

 *a*2 – 10*a* + 74 = *a*2 + 8*a* + 16

 18*a* = 58

 

 ∴ The coordinates of point *C* are .

 (b) *BC* = units =  units

 When *BC* is the base, the height of △*ABC* = 7 units

 ∴ Area of △*ABC* = sq. units = 25.28 sq. units, *cor*. *to 2 d*.*p*.

 (c) units

 units

 units

 

 ∴ *h* = 4.43, *cor*. *to 2 d*.*p*.

1. [Choosing a rectangular coordinate system with *C* as the origin and every unit

 being 1 m, we can mark the coordinates of various points as shown.]

*x*

*y*

*B*(19, 0)

*A*(19, 15)

*P*(9, 8)

*C*(0, 0)

 

 

 

 

  Entrance *C* has the shortest distance from Jane.

 ∴ She should choose entrance *C*.

3. (a) Slope of *BC* = 

∴ 

3(*k* – 7) = –2(*k* – 2)

3*k* – 21 = –2*k* + 4

5*k* = 25

 ∴ *k* = 5

 (b) The coordinates of point *C* are (5 , 5).

 Slope of *AC* = 

 The slopes of *AB*, *BC* and *AC* are 1,  and  respectively.

 ∴ *AB* is steeper.

4. (a) Slope of *PQ* 

 Slope of *QR* 

 Slope of *RS* 

 Slope of *PS* 

 (b) *PQ* 

 *QR* 

 *RS* 

 *PS* 

 (c) Slope of *PQ* × slope of *QR* 

 ∴ *PQ* ⊥ *QR*

 Slope of *RS* × slope of *PS* 

 ∴ *RS* ⊥ *PS*

  *PQ* = *RS* and *QR* = *PS*

 ∴ *PQRS* is a rectangle.

5. Slope of *LM* = 

 

 Slope of *MN* =  

 ∵ Slope of *LM* = slope of *MN*

 ∴ Three points *L*, *M* and *N* lie on the same straight line.

6. (a) Since point *C* is on the *x*-axis, the *y*-coordinate of point *C* = 0.

 We have *AC* : *CB* = 1 : *r*.

 If we consider the *y*-coordinate of point *C* with the section formula, then

 

 (b) Let the coordinates of point *C* be (*a* , 0).

 If we consider the *x*-coordinate of point *C* with the section formula, then

 

 ∴ The coordinates of point *C* are (3 , 0).

7. (a) Let *PO* : *OQ* = 1 : *r*.

 If we consider the *x*-coordinate of point *O* with the section formula, then

 

 ∴ *PO* : *OQ* = 1 :

or *PO* : *OQ* = 2 : 3

 (b) Let the coordinates of point *A* be (*m*, *n*).

 We have *OA* : *AQ* = *PO* : *OQ* = 2 : 3.

 If we consider the *x*-coordinate of point *A* with the section formula, then

 

 If we consider the *y*-coordinate of point *A* with the section formula, then

 

 ∴ The coordinates of point *A* are ( , ).

8. (a) Consider the coordinate system as shown

 in the figure.

 According to the section formula,

*A* (*a*, *b*)

*B*

*C* (*c*, 0)

*P*

*Q*

*y*

*x*

 the coordinates of *P* are

 , i.e. ;

 the coordinates of *Q* are

 , i.e. .

 Since *P* and *Q* have the same *y*-coordinate

 , *PQ* is a horizontal line.

 i.e. *PQ* is parallel to the *x*-axis.

 ∴ *PQ* // *BC*

 (b) 



 *BC* = *c* – 0 = *c*

 ∴ 