| F          | Requir                 | emen    | t          |  |
|------------|------------------------|---------|------------|--|
|            |                        |         |            | scale is given for drawings  |
|            |                        |         |            | Force 1 drawn to scale on 1st set of axes  |
|            |                        |         |            | Force 2 drawn to scale on 2nd set of axes  |
|            |                        |         | tic        | seting up the Force equation correctly for Force 1   |
|            |                        |         | me         | spiting r-hat into cosθx-hat+sinθy-hat   |
|            |                        |         | Arithmetic | multiplying mass times acceleration  |
|            |                        | e 1     | 4          | distributing (FOIL-ing) the force into the component vectors                               |
|            |                        | Force 1 | its        | using correct units for mass and accelaration  |
|            |                        | ш       | units      | calculation finishes with units that have the correct order of magnitude                   |
|            |                        |         |            | calculation leads to correct units for a force.  |
|            | ple                    |         |            | Force 1 x-component entered in table Force 1 y-component entered in table                  |
|            | component table        |         | ()         | seting up the Force equation correctly for Force 1   |
|            | ner                    |         | etic       | setting up the Force equation correctly for Force 1 spiting r-hat into cosθx-hat+sinθy-hat |
|            | οdι                    |         | hm         | multiplying mass times acceleration  |
|            | con                    | 0.1     | Arithmetic | distributing (FOIL-ing) the force into the component vectors                               |
|            |                        | Force 2 |            | using correct units for mass and accelaration  |
|            |                        | For     | units      | calculation finishes with units that have the correct order of magnitude                   |
|            |                        |         | ב          | calculation leads to correct units for a force.  |
|            |                        |         |            | Force 1 x-component entered in table   |
| _          |                        |         |            | Force 1 y-component entered in table   |
| cise       |                        |         |            | x-components are summed correctly to yeild Resultant x-component                           |
| exercise 1 |                        |         |            | y-components are summed correctly to yeild Resultant y-component                           |
| Φ          | Ø                      | Ford    | ce 2 ha    | as been drawn starting from the tip of Force 1 (or vice versa) on the lower set of         |
|            | wir                    |         |            | axes and both are to scale.  |
|            | F <sub>R</sub> drawing |         | Resulta    | ant force has been drawn from the origin of the lower axes to the tip of the sum           |
|            |                        |         |            | of the component axes .  |
|            | ArcTangent             |         |            |  |
|            |                        | the     | e angle    | e of the reultant vector from the x-axis has been found using the arctan function          |
|            |                        |         |            | the operand of arctan is set up as y-component over x-component                            |
|            |                        |         |            | units have been included and cancled correctly   |
|            | Ar                     | the qua |            | adrent of the Resultant force has been accounted for and the actual angle of the           |
|            |                        |         |            | resultant vector has been found  |
|            | 2                      | r calc  |            | pythagorean theorum set up properly  |
|            | <sub>R</sub> Ca        |         |            | units have been calculated correctly   |
|            | F                      |         |            | Arithmetic has been performed correctly  |
|            | F <sub>E</sub> calc    |         |            | F=ma used properly   |
|            |                        |         |            | units have been calculated correctly   |
|            | ŀ                      |         |            | Arithmetic has been performed correctly  |
|            | difs                   | the     | % diffe    | erence has been found between the magnagues of the calculated and measured                 |
|            | p %                    |         |            | forces   |
|            |                        |         |            | difference in angle between the calculated and meaured angles is calculated                |
|            |                        |         |            | subtotal   |

| _          |                 |   |            |  |  |  |
|------------|-----------------|---|------------|--|--|--|
|            |                 |   |            | scale is given for drawings  |  |  |
|            |                 |   |            | Force 1 drawn to scale on 1st set of axes  |  |  |
|            |                 |   |            | Force 2 drawn to scale on 2nd set of axes  |  |  |
|            |                 |   | tic        | seting up the Force equation correctly for Force 1                                   |  |  |
|            |                 |   | me         | spiting r-hat into cosθx-hat+sinθy-hat   |  |  |
|            |                 |   | Arithmetic | multiplying mass times acceleration  |  |  |
|            |                 | 9 1   | ٧          | distributing (FOIL-ing) the force into the component vectors                         |  |  |
|            |                 | Force   | ts         | using correct units for mass and accelaration  |  |  |
|            |                 | Ľ.  | units      | calculation finishes with units that have the correct order of magnitude             |  |  |
|            |                 |   |            | calculation leads to correct units for a force.                                      |  |  |
|            | ble             |   |            | Force 1 x-component entered in table   |  |  |
|            | component table |   |            | Force 1 y-component entered in table   |  |  |
|            | ent             |   | tic        | seting up the Force equation correctly for Force 1                                   |  |  |
|            | pon             |   | me         | spiting r-hat into cosθx-hat+sinθy-hat   |  |  |
|            | luc             |   | Arithmetic | multiplying mass times acceleration  |  |  |
|            | Ö               | e 2   | ⋖          | distributing (FOIL-ing) the force into the component vectors                         |  |  |
|            |                 | Force 2   | ts         | using correct units for mass and accelaration  |  |  |
|            |                 | Ľ.  | units      | calculation finishes with units that have the correct order of magnitude             |  |  |
|            |                 |   |            | calculation leads to correct units for a force.                                      |  |  |
|            |                 |   |            | Force 1 x-component entered in table   |  |  |
| se 2       |                 |   |            | Force 1 y-component entered in table   |  |  |
| exercise 2 |                 |   |            | x-components are summed correctly to yeild Resultant x-component                     |  |  |
| exe        |                 |   |            | y-components are summed correctly to yeild Resultant y-component                     |  |  |
|            | ng              | Force 2 has been drawn starting from the tip of Force 1 (or vice versa) on the lower set of |            |  |  |  |
|            | $F_R$ drawing   |   |            | axes and both are to scale.  |  |  |
|            | dr              | The F   | Result     | ant force has been drawn from the origin of the lower axes to the tip of the sum     |  |  |
|            | 4               |   |            | of the component axes .  |  |  |
|            |                 |   |            |  |  |  |
|            | gent            | the   | e angle    | e of the reultant vector from the x-axis has been found using the arctan function    |  |  |
|            |                 |   |            | the operand of arctan is set up as y-component over x-component                      |  |  |
|            | ArcTar          | 5   |            | units have been included and cancled correctly                                       |  |  |
|            | Ar              | tl  | he qua     | adrent of the Resultant force has been accounted for and the actual angle of the     |  |  |
|            |                 |   |            | resultant vector has been found  |  |  |
|            | lc              |   |            | pythagorean theorum set up properly  |  |  |
|            | calc            |   |            | units have been calculated correctly   |  |  |
|            | F <sub>R</sub>  |   |            | Arithmetic has been performed correctly  |  |  |
|            | C               |   |            | F=ma used properly   |  |  |
|            | calc            |   |            | units have been calculated correctly   |  |  |
|            | FE              |   |            | Arithmetic has been performed correctly  |  |  |
|            | Ś               | the   | % diffe    | erence has been found between the magnagues of the calculated and measured           |  |  |
|            | difs            |   |            | forces   |  |  |
|            | %               |   |            | difference in angle between the calculated and meaured angles is calculated          |  |  |
|            |                 |   |            |  |  |  |
|            |                 |   |            | subtotal   |  |  |
|            |                 |   |            |  |  |  |
|            |                 |   |            | subtotal<br>scale is given for drawings<br>Force 1 drawn to scale on 1st set of axes |  |  |

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|                               |  |            | Force 2 drawn to scale on 2nd set of axes  |  |  |
|-------------------------------|--|------------|--|--|--|
|                               |  | <u>:</u>   | seting up the Force equation correctly for Force 1                                 |  |  |
|                               |  | net        | spiting r-hat into cosθx-hat+sinθy-hat   |  |  |
|                               |  | Arithmetic | multiplying mass times acceleration  |  |  |
|                               | 1  | A          | distributing (FOIL-ing) the force into the component vectors                       |  |  |
|                               | Force 1  | S          | using correct units for mass and accelaration                                      |  |  |
|                               | FC   | units      | calculation finishes with units that have the correct order of magnitude           |  |  |
|                               |  |            | calculation leads to correct units for a force.                                    |  |  |
|                               |  |            | Force 1 x-component entered in table   |  |  |
|                               |  |            | Force 1 y-component entered in table   |  |  |
|                               |  | tic        | seting up the Force equation correctly for Force 1                                 |  |  |
|                               |  | Arithmetic | spiting r-hat into cosθx-hat+sinθy-hat   |  |  |
| o                             |  | rith       | multiplying mass times acceleration  |  |  |
| abl                           | e 2  | ⋖          | distributing (FOIL-ing) the force into the component vectors                       |  |  |
| nt t                          | Force 2  | ts         | using correct units for mass and accelaration                                      |  |  |
| one                           | ш  | units      | calculation finishes with units that have the correct order of magnitude           |  |  |
| component table               |  |            | calculation leads to correct units for a force.                                    |  |  |
| 00                            |  |            | Force 2 x-component entered in table   |  |  |
|                               |  |            | Force 2 y-component entered in table   |  |  |
|                               |  | etic       | seting up the Force equation correctly for Force 1                                 |  |  |
|                               |  | hm         | spiting r-hat into cosθx-hat+sinθy-hat<br>multiplying mass times acceleration      |  |  |
|                               |  | Arithmetic | distributing (FOIL-ing) the force into the component vectors                       |  |  |
|                               | Force 3  |            | using correct units for mass and accelaration                                      |  |  |
|                               | For  | units      | calculation finishes with units that have the correct order of magnitude           |  |  |
|                               |  | - L n      | calculation leads to correct units for a force.                                    |  |  |
|                               |  |            | Force 3 x-component entered in table   |  |  |
|                               |  |            | Force 3y-component entered in table  |  |  |
|                               |  |            | x-components are summed correctly to yeild Resultant x-component                   |  |  |
|                               |  |            | y-components are summed correctly to yeild Resultant y-component                   |  |  |
| ρū                            | Ford   | ce 2 ha    | as been drawn starting from the tip of Force 1 (or vice versa) on the lower set of |  |  |
| win                           |  |            | axes and both are to scale.  |  |  |
| $F_{R}$ drawing               | The F  | Resulta    | ant force has been drawn from the origin of the lower axes to the tip of the sum   |  |  |
| $_{\rm R}$                    |  |            | of the component axes .  |  |  |
|                               |  |            |  |  |  |
| nt                            | the  | e angle    | e of the reultant vector from the x-axis has been found using the arctan function  |  |  |
| nge                           |  |            | the operand of arctan is set up as y-component over x-component                    |  |  |
| ArcTangent                    | units have been included and cancled correctly |            |  |  |  |
| Ar                            | tl   | he qua     | adrent of the Resultant force has been accounted for and the actual angle of the   |  |  |
|                               |  |            | resultant vector has been found  |  |  |
| Ic                            |  |            | pythagorean theorum set up properly  |  |  |
| F <sub>R</sub> calc           |  |            | units have been calculated correctly   |  |  |
| Arithmetic has been performed |  |            | Arithmetic has been performed correctly  |  |  |
| alc                           |  |            | F=ma used properly   |  |  |
| F <sub>E</sub> calc           |  |            | units have been calculated correctly   |  |  |
| ш                             |  |            | Arithmetic has been performed correctly  |  |  |

| S.        | the % difference has been found between the magnagues of the calculated and measured |
|-----------|--|
| difs difs | forces   |
| %         | difference in angle between the calculated and meaured angles is calculated          |
|           | subtotal   |
|           | total  |

| Possible points |              |
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| 2<br>1<br>3<br>3<br>3<br>1<br>1<br>1<br>1<br>1<br>2<br>2<br>2<br>2<br>2<br>3<br>3<br>3<br>3<br>3   |       |
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